



To (515)239-1538

Internet Bid Proposal Download Acknowledgement

Failure to do so, may be cause to disqualify your bid proposal submission.

Proposal Description: Furnish & Install Back up Generators for 4 Rest Areas

Federal Tax ID: _____

If you have any questions or concerns, please call (515)239-1310

Office of Procurement and Distribution
800 Lincoln Way
Ames, IA 50010

		Date Bids Due: June 26, 2009	Time of Bid Opening: 1:00 P.M.	
Proposal Number: LT00716	Commodity Description: Furnish and Install Back-up Generators for 4 Interstate Rest Areas		Bid Opening Location: Ames, IA	
Contract to Begin: July 20, 2009	Date of Completion: November 6, 2009	Proposal Guaranty Amount: \$5,000.00 per site	Liquidated Damages: \$125.00/Day	
Purchasing Agent to contact for additional info.: Mary Zimmerman	e-mail: mary.zimmerman@dot.iowa.gov	Phone: 515-239-1298	Fax: 515-239-1538	
Company Name:			Federal Tax ID:	
Street Address:		City:	State:	Zip Code:
Individual preparing bid (type or print);	e-mail:	Phone:	Fax:	
Will you sell these items/services to political subdivisions within the State of Iowa under the same prices, terms and conditions as specified? <input type="checkbox"/> Yes <input type="checkbox"/> No		Are you an Iowa Targeted Small Business? <input type="checkbox"/> Yes <input type="checkbox"/> No		

GENERAL INFORMATION

This bid package includes the proposal, schedule of prices, standard terms and conditions, supplemental terms, specifications, mailing label and other information you need to prepare your bid. The pages of the document labeled "Bid response" must be typed or completed in ink, signed, and returned in a flat style envelope prior to the bid opening date and time. Please use the furnished mailing label, or indicate on your return bid by marking "Iowa Department of Transportation, proposal number & letting date" on the outside of the return envelope. The bidder may personally deliver, mail, or select a carrier that ensures timely delivery. **Faxed bids will not be accepted.**

If required, each bid must be accompanied by a proposal guaranty in an accepted form, in the sum indicated above. Refer to the Standard Terms and Conditions for the accepted forms in which the proposal guaranty requirement may be fulfilled. Bids lacking a required proposal guaranty will not be considered for award. If the contractor fails to enter into a formal contract within fifteen (15) days after award is made, the proposal guaranty may be retained by the State.

PROPOSAL STATEMENT

The entire contents of this Proposal, Addendums to the Proposal, Specifications, Supplemental Terms and Conditions, Standard Terms and Conditions, and Schedule of Prices shall become part of the contract.

We promise to enter into a contract within fifteen (15) days after award or forfeit the proposal guaranty furnished herewith.

We promise to furnish all materials, equipment and/or services specified, in the manner and the time prescribed, at prices hereinafter set out.

We certify that we have not, either directly or indirectly, entered into any agreement or participated in any collusion or otherwise taken any action in restraint of free competition; that no attempt has been made to induce any other person or firm to submit or not to submit a bid; that this bid has been independently arrived at without collusion with any other bidder, competitor, or potential competitor; and that this bid has not been knowingly disclosed prior to the opening of bids to any other bidder or competitor.

We certify that all materials, equipment and/or services proposed meet or exceed the specifications and will be supplied in accordance with the entire contents of this proposal.

We promise to complete the contract within the contract period, or pay any liquidated damages, if stipulated, for each calendar day as set forth in the bid documents.

Signed _____ Date _____

Iowa Department of Transportation
Schedule of Prices
Proposal No.: LT00716
Furnish and Install Back-up Generators for 5 Interstate Rest Areas
Letting Date: June 26, 2009 1:00 P.M.

Project Description: Furnish and Install Back-up Generators for 4 Interstate Rest Areas according to plans and specifications. **Items are not tied.**

Item No.	Description	Quantity	Unit Price Dollar/Cents	Amount. Dollars/Cents
1	Scott County – I-80 WB Rest Area Project No.: IMN-80-8(262)299—OE-82	1 each	Lump/Sum	\$_____
2	Story County – I-35 NB Rest Area Project No.: IMN-35-5(98)120—OE-85	1 each	Lump/Sum	\$_____
3	Iowa County – I-80 EB & WB Rest Area Project No.: IMN-80-6(295)207—OE-48	1 each	Lump/Sum	\$_____
4	Cedar County - Near Wilton, EB & WB Rest Area Project No.: IMN-80-8(260)269—OE-16	1 each	Lump/Sum	\$_____
Additional discount for <u>each</u> item if awarded two items				_____%
Additional discount for <u>each</u> if awarded three items				_____%
Additional discount for <u>each</u> if awarded all items				_____%

I hereby certify that this proposal meets or exceeds the minimum requirements including specifications and addendums.

Contact Person:

(Print Name)

Federal Tax I.D. No.: _____

Contractor's
Registration No.: _____

Email: _____

I acknowledge receipt of addendum
nos.: _____

Authorized
Signature _____

Company _____

Address _____

(City) (State) (Zip Code)

Phone No: _____

Fax No.: _____

Iowa Department of Transportation
PURCHASING PROPOSAL
Standard Terms and Conditions

Contents of Contract: The entire contents of this proposal shall become a part of the contract or purchase order. In case of a discrepancy between the contents of the contract documents, the following items listed by descending order shall prevail:

- Addendums
- Purchasing Proposal/Schedule of Prices
- Specifications, Plans and Drawings
- Supplemental Terms and Conditions
- Standard Terms and Conditions

For example, if there is a statement in the specifications that contradicts a statement in the Standard Terms and Conditions, the statement in the specifications shall apply.

Preparation of Proposal: All proposals must be completed in every respect and must clearly answer all questions contained in the proposal. Bids must be typed or completed in ink on the forms supplied by the department. **You must sign your bid and seal it in the envelope.** Bids must be received prior to the bid opening date and time. The bidder may personally deliver, mail, or select a carrier that ensures timely delivery

Proposal Guaranty: If required, a proposal guaranty, in the sum listed on the proposal form, can be supplied in one of the following ways: (1) A certified check or credit union certified share draft, cashier's check, or bank draft, drawn on a solvent bank or credit union, may be certified furnished with your bid. Certified checks and certified share drafts shall be drawn and endorsed in the amount indicated. Checks or drafts shall be made payable either to the Iowa Department of Transportation (Iowa DOT) or to the bidder. If payable to the bidder, the check or draft shall be endorsed, without qualifications, to the Iowa DOT by the bidder or his authorized agent. (2) An insurance or surety company may be retained to provide a bond in fulfillment of the proposal guaranty requirement. A properly completed and signed copy of the Proposal Guaranty (Form 131071) must accompany the bid. The Iowa DOT's Proposal Guaranty form must be used, no other forms or formats will be accepted.

Bid Opening: Bid Openings are public and conducted at the Ames complex unless otherwise specified. Proposals received after the time of the bid opening will be returned unopened.

Debarment and Vendor Suspension: By submitting a proposal, the contractor is certifying that it and its Principals and/or subcontractors are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by the State of Iowa or any Federal department or agency.

Communications: Questions concerning this proposal should be directed to the Purchasing Agent listed on the Purchasing Proposal. Inquiries can be written, phoned, or faxed. In all cases, written communication will take precedence over verbal communication.

Acceptance/Rejection: The State of Iowa reserves the right to accept or reject any or all bids and to waive irregularities or technicalities, provided such waiver does not substantially change the offer or provide a competitive advantage to any vendor, in the judgment of the Iowa DOT. The Iowa DOT also reserves the right to accept that bid which is deemed to be in the best interests of the state. Any unauthorized changes, additions, or conditional bids including any ties to another bid or proposal or any reservations about accepting an award or entering into a contract, may result in rejection of the bid. Bids must remain available for award for thirty (30) days from date of bid opening.

Method of Award: Award shall be made to the lowest responsible, responsive bidder unless otherwise specified. By virtue of statutory authority preference will be given to products and provisions grown and coal produced within the State of Iowa.

Award Protests: Protests of award recommendations are to be addressed to the Director of Purchasing, and shall be made in accordance with paragraph 761--20.4(6)"e", Iowa Administrative Code.

Bid Results & Disclosure: A bid tabulation will be sent to all responsive bidders with an award recommendation indicated. At the conclusion of the selection process, the contents of all proposals will be placed in the public domain and be open to inspection by interested parties, according to state law. Trade secrets or proprietary information that are recognized as such and are protected by law may be withheld if clearly identified as such in the proposal.

Contracts: Successful contractor(s) may be sent either a formal Contract or a Notification of Award as confirmation of acceptance and award. Contracts shall be for the term stated on the Proposal and may be extended for additional period(s) under the same terms and conditions upon mutual agreement. The contractor may not assign the contract to another party without written authorization from the Office of Procurement and Distribution.

Pricing and Discount: Unit prices shown on the bid/proposal shall be quoted as the price per unit (e.g., gal., case, each, etc.) as stated on the request. If there is a discrepancy between the unit bid prices, extension, or total amount of bid, the unit prices shall prevail. Unless otherwise indicated, prices shall be firm for the duration of the contract or purchase. Discounts for early payment are allowed, but not considered in award of the contract.

Taxes: Prices quoted shall not include state or federal taxes from which the state is exempt. Exemption certificates will be furnished upon request.

Faxed bids will not be accepted.

Payment Terms: The Iowa DOT will normally pay properly submitted vendor invoices within fifteen (15) days of receipt, providing goods and/or services have been delivered, installed or inspected (if required), and accepted. Invoices presented for payment must be only for quantities received by the Iowa DOT, must reference the purchase order number, and be submitted for processing.

Quality: All material shall be new and of first quality. Items which are used, demonstrators, refurbished, obsolete, seconds, or which have been discontinued are unacceptable without prior written approval by the Iowa DOT.

Recycled Content: The Iowa Code encourages purchase of products and materials with recycled content, including but not limited to paper products, oils, plastic products, compost materials, aggregate, solvents, and rubber products. When bidding recycled items or alternatives, note on your bid the recycled content, if known.

Infringement: Goods shall be delivered free of the rightful claim of any third party by way of infringement. Contractor shall indemnify and save harmless the State of Iowa and the Iowa DOT against all claims for infringement of, and/or royalties claimed under, patents or copyrights on materials and equipment furnished under this bid.

Default: Failure of the contractor to adhere to specified delivery schedules or to promptly replace rejected materials shall render the contractor liable for all costs in excess of the contract price when alternate procurement is necessary. This shall not be the exclusive remedy and the Iowa DOT reserves the right to pursue other remedies available to it by law or under the terms of this contract.

Ames Deliveries: Materials delivered to the Distribution Center's Receiving Section, 800 Lincoln Way, Ames, IA shall be delivered between the hours of 7:30 a.m. and 3:30 p.m. on any day except Saturday, Sunday, or a holiday. For deliveries to locations other than the Distribution Center, the contractor may wish to contact the destination location for available times to deliver, as some Iowa DOT offices and locations work a non-standard work week.

Delivery: Deliveries shall be F.O.B. destination unless otherwise specified. All deliveries shall be accompanied by a packing slip indicated the vendor, quantities shipped, and the purchase order number(s). All delivery charges shall be included in the bid price and paid by the contractor. No collect or C.O.D. deliveries will be accepted. When entering into a contract, the contractor shall notify the freight company that all freight and delivery charges are to be prepaid by the contractor. The Iowa DOT will not be liable for any freight claims or unpaid freight bills arising from this contract.

Applicable Law: The contract shall be governed under the laws of the State of Iowa. The contractor shall at all times comply with and observe all federal and state laws, local laws, ordinances, and regulations which are in effect during the period of this contract and which in any manner affect the work or its conduct. Any legal action relating to the contract shall only be commenced in the Story County, Iowa, District Court or the United States District Court for the Southern District of Iowa.

Administrative Rules: For Additional details on the rules governing the actions of the Office of Procurement and Distribution refer to 761 IAC, Chapter 20, Iowa Administrative Code, entitled "Procurement of Equipment, Materials, Supplies and Services".

Equal Opportunity: Firms submitting bids must be an "Equal Opportunity Employer" as defined in the Civil Rights Act of 1964 and in Iowa Executive Order Number Thirty-four.

Affirmative Action: The contractor (and also subcontractor, vendor, or supplier) is prohibited from engaging in discriminatory employment practices forbidden by federal and state law, executive orders and rules of the Iowa Department of Management, pertaining to equal employment opportunity and affirmative action. Contractor may be required to have on file a copy of their affirmative action program, containing goal and time specifications. Contractors doing business with Iowa in excess of \$5,000 annually and employing 50 or more full time employees may be required to file with the Iowa Department of Management a copy of their affirmative action plan. Failure to fulfill these non-discrimination requirements may cause the contract to be canceled and the contractor declared ineligible for future state contracts or subject to other sanctions as provided by law or rule.

Targeted Small Businesses: The Iowa DOT seeks to provide opportunities for women and/or minority small business enterprises. To apply for certification as an Iowa Targeted Small Business, contact the Iowa Department of Inspection and Appeals (515-281-7357). Contractors shall take documented steps to encourage participation from Targeted Small Businesses for the purpose of subcontracting and supplying of materials.

Interest in Contract: No state or county official or employee, elective or appointive shall be directly or indirectly interested in any contract issued by the Iowa DOT, See Code of Iowa 314.2.

Records Audit: The contractor agrees that the Auditor of the State of Iowa or any authorized representative of the state, and where federal funds are involved, the Comptroller General of the U.S. Government, shall have access to and the right to examine, audit, excerpt, and transcribe any directly pertinent books, documents, papers, and records of the contractor relating to orders, invoices, or payments of this contract.

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Furnish and Install Back up Generators for 4 Interstate Rest Areas
Letting Date: June 26, 2009 1:00 P.M.

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**Iowa Department of Transportation
General Requirements
Proposal No.: LT00716
Furnish and Install Back-up Generators for 4 Interstate Rest Areas
Letting Date: June 26, 2009 1:00 P.M.**

Part 1 General Conditions

1.1 Scope of Work

Furnish and install back-up generators and associated wiring and switches according to plans and specifications. Includes minor grading, sidewalk construction, furnishing and installing LP gas lines, and furnishing and installing fence.

1.2 Adoption of General Conditions

- A. The General Requirements of this Contract shall include the "General Conditions", "Instructions to Bidders" and the "Supplementary General Conditions" as herein stated.
- B. "THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION", A.I.A. FORM #A-201, LATEST EDITION AND A.I.A. DOCUMENT, "INSTRUCTIONS TO BIDDERS", FORM #A-701, LATEST EDITION, SHALL BE INCLUDED, AS MODIFIED IN THE "SUPPLEMENTARY INSTRUCTIONS TO BIDDERS" AND "SUPPLEMENTARY GENERAL CONDITIONS", AND BOUND WITH THE STANDARD FORM OF AGREEMENT BETWEEN THE CONTRACTOR AND OWNER", A.I.A. FORM #101, LATEST EDITION, AS A PART OF THIS CONTRACT SPECIFICATION.
- C. All bidder information and conditions, bid check lists and similar documents included in the specification by the Office of Purchasing and Distribution of the Iowa Department of Transportation, Ames, Iowa are hereby made a part of the General Conditions.

Part 2 Supplementary Instructions to Bidders

2.1 General

A. Owner:

The Owner of this project is the Iowa Department of Transportation, 800 Lincoln Way, Ames, Iowa 50010.

Rest Area Generator Projects. See Specifications for Locations:

Item	Rest Area	Location	Contact Site Visit Information
1	Scott County	I-80 WB	Gary Graham, 515-290-3175
2	Story County	I-35 NB	Wayne Williams, 515-290-2815
3	Iowa County	I-80, EB & WB	Armin Martin, 515-290-2818
4	Cedar County near Wilton, EB & WB		Gary Graham, 515-290-3175

Items are not tied.

Rest Area Administrator for All Sites:

Steven McMenamin

Phone No. 515-239-1680 Fax No. 515-239-1005

Email: steven.mcmenamin@dot.iowa.gov

B. Contract Document Information:

Questions regarding the bidding documents should be directed to:

Office of Procurement and Distribution

Purchasing Agent – Mary Zimmerman

Phone No.: 515-239-1298 Fax No.: 515-239-1538

Email: mary.zimmerman@dot.iowa.gov

Plans have been mailed to local plan rooms.

To request a bid packet for this project, access our website

<http://www.iowadot.gov/purchasing/lettingschedule.htm> , or contact the Office of Procurement and Distribution, Purchasing Office at 515-239-1310. Plan holders lists for this project can be obtained by calling this number.

C. Contract Award:

- Award will be based on the total lump sum amount of bid price shown on the Schedule of Prices. Items are not tied. Note applicable discount if bid more than one site. Bid price will include all requirements listed in Specifications, Drawings and Supplemental Terms to complete this proposed project. The Prime Contractor shall be responsible for taking all sub-bids and for all coordination between trades.
- A single "Prime" contract shall be awarded for all work shown on the Drawings and described in the Specifications including Site work, General construction, Demolition, Plumbing, Mechanical, Energy management and control and Electrical work. The Prime Contractor shall be responsible for taking all sub-bids and for all coordination between trades.
- Protests of award recommendations shall be made in accordance with Paragraph 761--20.4(6)"e", Iowa Administrative Code.
- Contractor shall return all contractual documents within fourteen (14) calendar days from date indicated in contract cover letter. ***If this is not returned within this time frame, contract may be voided and awarded to the next low bidder.***

2.2 Bidders Representatives

A. Site Visit:

Prospective bidders on this project are recommended, but not required, to visit the job site prior to submitting a quotation for this work. Failure to conduct an on-site survey will not be grounds for disqualification of a bid at the discretion of the Owner/Engineer. To arrange an on-site visit, contact Rest Area Administrator, Steven McMenamin, phone number 515-239-1680.

- No considerations or revision in the contract price or scope of the project will be considered by the Owner for any item which could have been revealed by a thorough on-site inspection and examination.

B. Conditions of Work:

Bidders must inform themselves fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve

successful bidders of their obligation to furnish all material and labor necessary to carry out the provisions of this contract. Insofar as possible, the Contractor, in carrying out the work, must employ such methods or means as will not cause any interruption of, or interference with the work of any other contractor.

B. Obligation of Bidder:

- At the time of the opening of bids, each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the drawings, specifications, and other contract documents, including all addenda.
- The failure or omission of any bidder to examine any form, instrument, or document shall in no way relieve any bidder from any obligation in respect to their bid.

D. Codes, Laws and Regulations:

The laws of the State of Iowa in relation to and pertaining to public improvements shall apply to this project. All construction, materials and methods shall comply with the State and Local Building Codes and with Local Ordinances, except where plans and specifications establish a higher standard.

E. Licenses, Permits And Inspections

The Vendor shall give all notices and comply with all codes, laws, ordinances, rules and regulations of any public authority having jurisdiction that bears on the performance of its work. The Vendor shall pay for all licenses, permits and inspection fees required for its work. The Vendor must furnish copies of all approved inspection certificates and approvals from authorities having jurisdiction in a timely fashion upon completion of the work.

2.3 Bidding Documents

A. Plans and Specifications:

- The Plans and Specifications are to remain on file at the Iowa DOT Office of Purchasing and Distribution, Purchasing Section, 800 Lincoln Way, Ames, IA 50010. The Iowa DOT shall furnish to the Contractor all copies of Plans and Specifications reasonably necessary for the execution of the work. No deposit is required for Contract Documents.
- In the event of a conflict between the specifications and the drawings, the specifications shall take precedence.

C. Contents of the Contract Documents:

- In case of a discrepancy between contents of the contract documents, the following items listed by descending order shall prevail:
 1. Addendum
 2. Proposal Form
 3. Special Provision
 4. Plans
 5. Supplemental Specifications

6. Standard Specifications

Should there be a discrepancy between figures and drawings on any of the contract documents, the figures shall govern unless they are obviously incorrect.

D. Interpretation of Contract Documents:

- If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of the Plans, Specifications or other proposed contract documents, the bidder will submit to the Iowa DOT a written request for an interpretation thereof. Requests for interpretation must be received on or before **June 19, 2009**.
- The person submitting a request will be responsible for its prompt delivery.
- No interpretation of the meaning of the drawings, specifications, or other pre-bid documents will be made to any bidder orally. Interpretations will be made only by addendum duly issued.
- A copy of such addendum will be mailed or delivered to each person receiving a copy of the contract documents and to such other prospective bidders having requested that they be furnished with a copy of each addendum.

D. Materials and Equipment:

- Names of Manufacturers and vendors listed in the bidding documents are listed for the bidders only. Manufacturers and vendors, in addition to those specifically listed, are acceptable when it is proven to the satisfaction of the Iowa DOT that:
 - a. The level of quality proposed is equal to or better than that of the referenced manufacturer/vendor's quality.
 - b. The technical characteristics of the proposed product meet or exceed the requirements of the drawings and specifications.
 - c. The use of the materials or equipment does not require major revisions of the drawings and specifications to permit their use.
- Any additional cost in other work incurred as a result of these approvals shall be borne by the Contractor, including all costs for modifying other related materials/systems and the cost of any additional engineering or design fees required to accommodate the substitution/approval.
- The Contractor must be confident that a proposed product or material meets or exceeds the requirements shown on the drawings and specifications. It will be the responsibility of the Contractor to verify and demonstrate that a proposed product meets or exceeds the drawings and specifications at time of shop drawing reviews. If a proposed product or material is determined to be technically unacceptable as judged by the Iowa DOT, the Contractor shall be required to supply products or materials that meet the requirements required to supply products or materials that meet the requirements stated in the drawings and specifications at no cost increase to the Iowa DOT. Under no circumstances will the Iowa DOT be required to prove that proposed substitutions is not equal to the project requirements. The decision of the Iowa DOT on all requested proposals/substitutions is final.

E. Exceptions/Equals

No substitutions, changes or additions to the request for proposals shall be permitted unless a written request for a substitution, change or addition is submitted to the department's purchasing office **by June 19, 2009 @ 1:00 P.M.** to allow an analysis and response to all bidders, and the substitution, change or addition is approved by the purchasing office. This document is found in "Bidding Requirements, Document 00163 – Pre-Bid Substitutions." The Purchasing Office shall notify all bidders of approved substitutions, changes or additions in an addendum.

F. Addenda:

- Addenda, if issued, will be mailed to all known plan holders, and acknowledgement of receipt of addenda will be indicated on the bidder's proposal form.
- All addenda so issued shall become part of the contract documents.

2.4 Bidding Procedures

A. Proposed Form:

- Each Bid must be submitted on the Schedule of Prices form included in the packet.
- All bids received by the Iowa DOT, which require allocation of appropriated state funds, are subject to the acceptance of the issuing department of the State of Iowa.

B. Proposal Guaranty:

Each bid must be supported by a Proposal Guaranty in the sum of **\$5,000.00**. The proposal guaranty shall be in the form of a certified check or credit union certified share draft, cashier's check, or bank draft drawn on a solvent bank or credit union. Certified checks or credit union certified share drafts shall bear an endorsement signed by a responsible official of such bank or credit union as to the amount certified. Cashier's checks or bank drafts shall be made payable either to the Contracting Authority or to the bidder and, where made payable to the bidder, shall contain an unqualified endorsement to the Contracting Authority signed by the bidder or his authorized agent. Certified checks and credit union share drafts shall be certified, or the cashier's check shall be drawn and endorsed, in an amount not less than prescribed in the proposal. Bid bond may be used for the proposal guaranty in lieu of that specified above. ***A bid bond must be submitted on Iowa Department of Transportation Form No. 131071 included in the packet or bid will be rejected.***

The proposal guaranty of the qualified responsive low bidder will be retained until a contract is entered into and the required Bonds and Insurance Certificates filed. All other bid securities will be returned after the award has been made.

C. Submitting Proposals:

- Each proposal must be submitted in ink or typewritten and shall be sealed in the envelope provided in the packet.

- Submit bids to The Iowa Department of Transportation, Operations & Finance Division, Office of Purchasing and Distribution, Purchasing Section, 800 Lincoln Way, Ames, Iowa 50010. Bids shall be due on or before **1:00 P.M., June 26, 2009**, and shall be read publicly thereafter.

D. Withdrawal Period:

Prime bidders, subcontractors and material suppliers on this project agree to guarantee their proposal for a period of thirty (30) days after the date of receipt of bids. No bid may be withdrawn during this period.

E. Extension of Contract Period:

The Iowa DOT will grant an extension of the contract period for additional work requiring additional construction time that adds additional work to the controlling item of work.

F. Liquidated Damages:

- Time is an essential of the contract, and it is important that the work be pressed vigorously to completion. The cost per day for liquidated damages is indicated on the Purchasing Proposal form.
- For each calendar day that any work shall remain uncompleted beyond the completion date or any extension granted under Extension of Contract Period, the amount per calendar day specified in the proposal form will be assessed, not as a penalty but as predetermined and agreed upon liquidated damages. If work remains uncompleted on more than one portion for which calendar days and liquidated damages have been specified, the liquidated damages assessed will be the total of the damages per day listed for each uncompleted portion. The Owner shall prepare and forward to the Contractor an invoice or credit change order for such liquidated damages. The final payment shall be withheld until payment of the invoice has been made or the credit change order has been agreed upon.
- Assessment of liquidated damages will be based only on the number of calendar days required to complete the contract beyond the contract completion date, plus authorized extensions.
- The provision for the assessment of liquidated damages for failure to complete work within the contract period does not constitute a waiver of the Owner's right to collect any additional damages other than time delays, which the Owner may sustain by the failure of the Contractor to carry out the terms of the contract.

G. Telegraph or Facsimile Modifications and Bid Closing:

- Bids received prior to the time of opening will be securely kept, unopened. The officer whose duty it is to open them will decide when the specified time has arrived, and no bid received thereafter will be considered.
- Modification of the bid price by telegraph or facsimile of bids already submitted will be considered if received prior to the time set for the opening. The changes shall not reveal the bid price but shall provide the amount to add or subtract to

modify the bid so the total amount is not known until the bid is opened.

H. Informalities:

The Owner may waive any informalities or reject any or all bids.

2.5 Consideration of Bids

A. Rejection of Bids:

- The Iowa DOT reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Iowa DOT that such bidder is properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein.
- Conditional bids will not be accepted.

B. Qualification of Bidder:

The Iowa DOT may make such investigations as they deem necessary to determine the ability of the bidder to perform the required work, and the bidder shall furnish to the Iowa DOT all such information and data for this purpose as the Iowa DOT may request.

2.6 Performance and Payment Bonds

A. Bonds:

Performance bond is not required on contracts for less than \$25,000. However, if the Contract is \$25,000 or more, the bidder shall furnish bonds covering the faithful performance of 100% of the Contract and the payment of all obligations arising thereunder. One copy of the bond shall be submitted on Iowa Department of Transportation Form 131070. All items must be properly filled in, including Contractor's signature. Resident commission agent or attorney-in-fact must file a copy of the power of attorney.

B. Power of Attorney:

Attorney-in-fact who signs the proposal guaranty, Performance Bond, and Labor and Material Payment Bond must file with each bond a certified and effectively dated copy of the Power of Attorney.

2.7 Notice of Tax Exempt Status

A Sales Tax Exemption Certificate and authorization letter will be issued to the successfully awarded construction contractor for the purchase of building materials, supplies and equipment used in the performance of this construction contract.

The Department of Transportation is exempt from paying sales and use taxes. ***Do not include sales tax in your bid for this project.***

2.8 Labor Regulations

All contractors, before entering into a contract with the Department, must be registered with

the Division of Labor in the Iowa Department of Workforce Development (515-281-3606) according to chapter 91C, Code of Iowa 2003.

2.9 Targeted Small Business Program

The 1986 Iowa Legislature enacted legislation relating to procurement from Iowa Targeted Small Businesses. (Iowa Code, Chapter 73. And Iowa Administrative Code rules 820--[01,B] Chapter 2). It is hereby agreed that when entering into a contract with the State of Iowa, the vendor/contractor will take documented steps to encourage participation from TSB's for the purpose of subcontracting and supplying of materials.

A list of Targeted Small Business Contractors is available on the Internet at <https://dia.iowa.gov/tsb> and click on Search Targeted Small Businesses.

Part 3 Supplementary General Conditions

3.1 The Contractor

A. Guidelines:

- Contractors shall comply with Iowa Occupational Safety and Health Standards as found in 29 CFR Parts 1910 and 1926. Of particular importance are those standards referring to the use of personal protective equipment, fall protection and ventilation.
- Contractor may be required to make available to Iowa DOT at time the apparent low bidder has been determined all Material Safety Data Sheets (MSDS) for all products provided prior to approved contractor and award. These must be faxed to Purchasing 515-239-1538 with cover indicating project the MSDS sheets pertain to. This shall be faxed within two (2) days upon request.
- Contractors shall comply with Health & Safety Contingency Plan provided by the Iowa DOT. See Attachment A.

B. Preference:

By virtue of statutory authority, a preference shall be given to Iowa Domestic labor and materials in the construction of this contract work, in accordance with the provision of Chapter 3, Code of Iowa 1993 and any amendments thereto.

C. Guarantee:

- The Contractor shall guarantee all work executed under this contract, both as the workmanship and materials, for a period of twelve (12) months after the date of acceptance, except that special guarantee provision specified elsewhere in these Specifications shall take precedence. Neither the final payment nor any provision of the contract documents shall relieve the Contractor of responsibility for faulty materials or workmanship. The Contractor shall remedy any defect thereto and pay for any damage to other work resulting therefrom, which shall appear within a period of one (1) year from the date of the final acceptance. With one month remaining in the guarantee period, the Contractor shall notify the Iowa DOT and set up a complete building walk-through inspection.
- All materials, items of equipment, and workmanship furnished under this division

of the specifications shall carry the standard warranty against all defects in material and workmanship. Any fault due to defective or improper material, equipment, or workmanship which may develop, shall be made good, forthwith.

- The Guarantee shall include, but not be limited to the following elements and services:
 - a. Repair or replace defective materials, equipment, workmanship and installation that develops within the guarantee period, promptly and to Iowa DOT's satisfaction and correct damage caused in making necessary repairs and replacements, including all other damage done to areas, materials, and other systems resulting from the failure or defect, under guarantee by and at the expense of the Contractor.
 - b. Replace material or equipment that requires excessive service during guarantee period, as defined and as directed by the Iowa DOT.
 - c. Make all service calls, replacements, repairs and adjustments during the guarantee period without cost to the Iowa DOT.

D. Workmanship

Work shall be performed in best, most workmanlike manner by mechanics, skilled and employed continuously in their respective trade. Installation shall be made by the manufacturer or their authorized installer where specified. Unsatisfactory work shall be replaced at Contractor's expense.

E. Shop Drawings and Samples:

- Shop drawings, specification data, and samples shall be submitted to the Iowa DOT for approval and/or selection prior to the placing of orders for any equipment and materials.
- Shop Drawings: Shop drawings shall be submitted after the schedule of proposed material and equipment has been approved. Submit details of systems and equipment to the Iowa DOT for review. Submit a minimum of eight binders containing one copy each of Shop Drawing of all systems and equipment as indicated in each Division of the specifications: (Note: Submission of Shop Drawings not in binders, but in loose sheet form, may be considered cause for rejection with resubmission in proper form required).
- Product Data: Submit manufacturer's product data to the Iowa DOT for approval, consisting of complete specifications, test report data, installation instructions, and other pertinent technical data required to complete product.
 - a. Intent of Shop Drawings and Product Data review is to check for capacity, rating and certain construction features. Ensure that work meets requirements of Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction, and for coordination of work of this and other Sections.
 - b. Perform work in accordance with submittals marked "No Exception Taken" to extent that they agree with Contract Documents. Submittal review shall not diminish responsibility under this Contract for

dimensional coordination, quantities, installation, wiring, supports, access, service and errors, nor for deviations from requirements of Contract Documents. Requirements of Contract Documents are not limited, waived, nor superseded by Shop Drawing Review

- c. Submittals of various systems shall indicate equipment supplier used and that all equipment of particular system is being furnished by same supplier. Supplier shall be qualified to supervise installation, connection and testing of system and have competent maintenance service for respective systems.
- d. Shop Drawings and samples will be reviewed with reasonable promptness and will be stamped indicating appropriate action as follows:
 - 1) **"No Exception Taken"** means that fabrication, manufacture, or construction may proceed providing submittal complies with Contract Documents.
 - 2) **"Make Corrections Noted"** means that fabrication, manufacture, or construction may proceed providing submittal complies with Engineer's notation and Contract Documents. If, for any reason, notations cannot be complied with, resubmit as described for submittals stamped **"Reject"**.
 - 3) **"Revise and Resubmit"** means submittal information is incomplete or ambiguous and therefore clarification or additional information is required to ascertain compliance with the contract documents, and that fabrication, manufacture or construction shall not proceed. Provide additional data required by the contract documents and resubmit.
 - 4) **"Reject"** means that submittal does not comply with Contract Documents and that fabrication, manufacture, or construction shall not proceed. Resubmit in accordance with requirements of Contract Documents.

F. Use of Premises:

- All Contractors shall confine all apparatus, storage of materials and construction to areas as directed by the Iowa DOT and shall not encumber the premises with materials.
- Notwithstanding any approvals or instructions which must be obtained by the Contractors from the Iowa DOT in connection with use of premises, the responsibility for the safe working conditions at the site shall remain that of the Contractors.

G. Cutting and Patching:

- Each Contractor shall cut holes necessary to install work.
- Similarly, each contractor shall perform all necessary patching that result from cutting of holes. The Prime Contractor shall resolve any conflict between trades, and it will be the contractor's responsibility to see all patches are made. Any and all through-wall penetration requiring structural modifications and or structural members shall be provided by the Prime Contractor.

H. Temporary Services:

The Contractor shall furnish the following temporary services and shall maintain same during the construction period:

- a. Enclosures:
Temporary closures shall be provided for all exterior openings during freezing or inclement weather.
- b. Electricity:
The Contractor shall verify the voltage available and provide connecting switches, fuse protection, and wiring necessary to provide temporary light and power throughout the building until the building services are ready for use.
- c. Construction Office:
Temporary office space may be provided by the contractor. Office trailers shall be located as directed by the Iowa DOT Representative.
- d. Telephone:
Telephone service of local exchange may be provided and maintained by the Contractor throughout the construction period on the project.
- e. Staging and Scaffolding:
 1. All staging and scaffolding, exterior and interior, required to be over eight feet in height shall be furnished and erected by each Contractor for the work under charge and maintained in safe condition for proper execution of the work.
 2. Staging, Scaffolding and other temporary construction shall be rigidly built in accordance with local and state requirements. Remove from premises upon completion of work.
- f. Hoisting Equipment and Machinery:
All hoisting equipment and machinery required for the proper and expeditious prosecution and progress of the work under this Contract shall be furnished, installed, operated and maintained in safe condition by the each respective Contractor for material and/or equipment delivered to the designated hoisting area. All costs for hoisting operating services shall be borne by the Contractor or Subcontractor for all work under charge.

I. Clean-Up:

- Throughout the period of construction, the Contractor shall clean up all work and yard areas and keep the area reasonably free of debris, etc., as required for proper protection of the work. Prior to final acceptance, the Contractor shall remove all debris, tools and equipment from the project site.
- Buildings and site shall be completely cleaned and made ready for occupancy by the Contractor prior to final acceptance by the Iowa DOT. This includes floors, windows, plumbing, and lighting fixtures, ceramic tile, walls, etc.

J. Immunity of Iowa Department of Transportation

The Contractor shall defend, indemnify and hold harmless the Iowa Department of Transportation, and its officials and employees from liability arising out of or resulting from the Contractor's activities at the rest area, its performance or attempted performance of the contract, as well as the Contractor's activities with Sub-Contractors and all other third parties.

K. Suspensions and Debarment.

The Vendor certifies pursuant to 48 CFR Part 9 that neither it nor its principles are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this Contract by any federal Agency or agency. The Vendor certifies that it is not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in any contracts with the State of Iowa.

L. Termination Due to Lack of Funds or Change in Law

Notwithstanding anything in this Contract to the contrary, and subject to the limitations set forth below, the Iowa DOT shall have the right to terminate this Contract without penalty and without any advance notice as a result of any of the following:

Adequate funds are not appropriated or granted to allow the Iowa DOT to operate as required and to fulfill its obligations under this Contract.

Funds are de-appropriated, reduced, not allocated, or receipt of funds is delayed, or if any funds or revenues needed by the Iowa DOT to make any payment hereunder are insufficient or unavailable for any other reason as determined by the Iowa DOT in its sole discretion; or

The Iowa DOT's authorization to conduct its business or engage in activities or operations related to the subject matter of this Contract is withdrawn or materially altered or modified; or

The Iowa DOT's duties programs or responsibilities are modified or materially altered; or

If there is a decision of any court, administrative law judge or an arbitration panel or any law, rule, regulation or order is enacted, promulgated or issued that materially or adversely affects the Agency's ability to fulfill any of its obligations under this Contract.

The Agency shall provide Vendor with written notice of termination pursuant to this section.

3.2 Administration of the Contract

A. Inspection and Supervision:

- All work shall be according to the approved design and shall be under the direct supervision of the Iowa DOT.
- Periodic site inspections will be carried on by the Iowa DOT with the contractor to ensure coordination of the project.
- The owner will provide a list of items requiring inspection prior to or during installation. The Contractor is to give the Owner notice no less than 24 hours in advance of installation.
- The Iowa DOT contact shall be: Steve McMenamin, Rest Area Administrator, Phone No.: 515-239-1680.

B. Contractors Construction Schedule:

The successful bidder will, within 10 days after award of contract or at the pre-construction meeting, whichever comes first, submit to the Iowa DOT, Office of Facilities Support, a detailed construction schedule including dates of commencement and completion on each phase of the proposed construction. Upon acceptance of the schedule, the Contractor will be expected to adhere to these dates as proposed.

Contractor cannot close down rest area to conduct work without prior authorized DOT approval.

C. Verifying Work of Other Contractors

- When a Contractor's work depends on proper execution of work by other contractors, such Contractor shall promptly report to Architect defects in such work and discrepancies between executed work and the Drawings and Specifications.
- Contractors shall employ such methods and means in carrying out work as will not cause interruption or interference with any other contractor. General Contractors shall give other contractors sufficient notice to permit installation of sleeves, piping, conduit, and other items, prior to placing concrete or laying masonry. Any Contractor failing to comply with above shall be responsible for expense caused by such failure.

3.3 Sub Contractors

- Specific attention shall be given by the Contractor to Article 5 of the A.I.A. Document A-201, "The General Conditions of the Contract for Construction".
- The apparent successful contractor for the project shall, within seven (7) calendar days after opening of the bids, furnish the Iowa DOT with a complete list of subcontractors and major material suppliers.
- The Iowa DOT shall maintain the list of subcontractors and major suppliers and issue a general approval of same after official award of the contract, subject to the specific requirements of the Plans, Specifications and the "General Conditions of the Contract, and of these supplementary Conditions," "Special Provisions," and elsewhere with contract documents, as applicable. Deviations from the list of subcontractors and material suppliers shall be made only with the specific approval of, or at the request of, the Iowa DOT.

3.4 Contract Period

- The starting and completion dates are stated on the front page of the proposal. The date of completion shall be stated in calendar days on the Contractor's proposal, and if necessary, adjusted by mutual agreement between the Iowa DOT and Contractor prior to executing the contract documents.
- The Iowa DOT realizes that deliveries and condition will have a definite bearing on the completion date. The Iowa DOT will demand diligence in the prosecution of the work, but with good cause and satisfactory past performance by the Contractor, the Iowa DOT may revise that completion date to another mutually-acceptable date, when requested in writing and in good faith by the Contractor.

3.4.1 Extra Work Orders

- a. For work covered by definite unit prices or lump sum amount in the contract, cost changes will be on the basis of quantity change.
- b. Extra work performed on a force account basis will be paid for in the following manner:
 - 1) The Contractor shall receive the rate shown on previous payrolls for time employees are actually engaged in extra work, to which shall be added an amount equal to 15 percent thereof, plus the amount of social security, plus cost of workman's contribution. The 15 percent shall cover compensation for furnishing of necessary tools and all other overhead items of expense. The wage of the employees partly on force account work shall be pro-rated.
 - 2) For materials used on force account work the Contractor shall receive the actual cost of materials delivered, including freight and hauling charges as shown by original receipted bills to which cost shall be added a sum equal to 15 percent thereof.

3.5 Payments and Completion

- A. Payments on contract will be made monthly by means of state warrants to the extent of ninety-five percent (95%) of the value of work performed, including acceptable material stored at the building site, as determined by the Engineer.
- B. Immediately after signing of Contract, the Contractor shall submit schedule of values for approval on the Contract Breakdown form furnished by the Iowa Department of Transportation. Contractor shall submit an Application for Payment on forms furnished by the Iowa Department of Transportation based on Contract Breakdown.
- C. The contractor shall, before the first application, submit to the Iowa DOT a schedule of values of the various parts of the work, aggregating the total sum of the contract, made out in such form as the Iowa DOT may direct and, if required, supported by evidence as to its correctness. This schedule, when approved by the Iowa DOT, shall be used as a basis for requests for payment.
- D. Final payment shall be authorized not later than thirty (30) days following the completion and final acceptance of the contract, provided that paragraph 1-3 herein and all other contract requirements have been fulfilled, accepted and approved, where no claims have been filed or following adjudication or release of claims as provided in Chapter 573 of the Code of Iowa.
- E. No notification of payment being processed, no payment made to the Contractor, no partial payment, nor the entire use or occupancy of the work by the Iowa DOT shall be held to constitute an acceptance, in whole or in part, by the Iowa DOT prior to making the final payment and acceptance in full completion of the contract.

3.6 Protection of Persons and Property

A. Safety and Health Regulations:

The Contractor, serving in the role of the employer for the project, shall exercise at all times the protection of all persons and property. Contractor shall comply with all requirements of the Occupational Safety and Health Act of 1970, Iowa Bureau of Labor and all applicable state and municipal laws, as well as building and construction codes. It is the Contractor's responsibility to enforce all regulations that apply to this project.

B. Protection of Site:

The Contractor shall furnish all permanent and temporary guards, signs, fencing, shoring, and underpinning and other protection necessary in the performance of the contract and for the necessary protection of all public and private property and shall be responsible for any damage caused by failure to comply with this requirement.

- After building operations are completed, the Contractor shall replace or satisfactorily repair all damaged walks or pavements which shall have become damaged due to operations of this project.
- The Contractor shall take care of all underground pipes, conduits, etc., encountered in the excavations, and protect same from damage until such time as they can be permanently disposed of.
- The Contractor shall continuously maintain adequate protection of all work from damage and shall protect the Owner's property and adjacent property from damage arising in connection with this contract.
- All finished floors shall be properly protected against damage.

3.7 Insurance Requirements

Contractor's Insurance

- It shall be the Contractor's responsibility to have liability insurance covering all of the project operations incident to contract completion and the Contractor(s) must have on file with the Contracting Authority a current "Certificate of Insurance" prior to award of contract. The certificate shall identify the insurance company firm name and address, contractor firm name, policy period, type of policy, limits of coverage, and scope of work covered (single contract or statewide). This requirement shall apply with equal force, whether the work is performed by persons employed directly by the Contractor(s) including a subcontractor, persons employed by a subcontractor(s), or by an independent contractor(s).
- In addition to the above, the Contracting Authority shall be included as an insured party, or a separate owner's protective policy shall be filed showing the Contracting Authority as an insured party.
- The liability insurance shall be written by an insurance company (or companies) qualified to do business in Iowa. For independent contractors engaged solely in the transportation of materials, the minimum coverage provided by such insurance shall be not less than that required by Chapter 325A, Code of Iowa, for such truck

operators or contract carriers as defined therein. For all other contractors, subcontractors, independent contractors, and the Contracting Authority, the minimum coverage by such insurance shall be as follows:

- Comprehensive General Liability including Contractual Liability;
- Contingent Liability; Explosion, Collapse and Underground Drainage
- Damage; Occurrence Basis Bodily Injury: Broad Form Personal Injury; Broad Form Property Damage.

Bodily Injury

The contractor will purchase and maintain throughout the term of this contract the follow minimum limits and coverage:

- Each person \$750,000
- Each accident/occurrence \$750,000
- Workers Compensation \$750,000
- Statutory Limits \$750,000
- Employer's liability \$750,000
- Pollution Liability \$750,000
- Occupation Disease \$750,000

Operations

- Property Damage \$250,000 each occurrence

Builders Risk Insurance (Optional):

- Each Contractor holding a valid contract with the Owner shall furnish and pay for builder's risk insurance, providing coverage for at least the following losses: fire, extended coverage, vandalism and malicious damage to materials incorporated in the project, and materials purchased to be incorporated in the project, either stored on or off the permanent job site. If this insurance coverage is not provided, the Contractor shall assume all responsibility for the perils outlined above which may occur prior to project completion and acceptance.
- Failure on the part of the Contractor(s) to comply with the requirements of this Article will be considered sufficient cause to suspend the work, withhold estimates, and to deny the Contractor(s) any further contract awards, as provided in Article 1103.01.
- The Contractor(s) shall require all subcontractor(s) meet the above insurance requirements.

The Certificate of Insurance must include the following;

- Iowa Department of Transportation must be listed as an additional insured
- Proposal Number
- Proposal Description
- Letting Date and
- Contract Period

3.8 Miscellaneous Provisions

A. Iowa State Building Code:

- All construction under this section shall conform to the requirements of the Iowa State Building Code. The provisions of the Iowa State Building Code will be strictly adhered to, and will take precedence over any local Governmental Body Regulations. Work not regulated by the Iowa State Building Code shall be performed in accordance with local Governmental Body Regulations.
- All construction shall conform to the Standard Specifications for Highway and Bridge Construction, Series 2001 where applicable.

B. Discriminatory Practices:

- All contractors or subcontractors working under the terms of this project are prohibited from engaging in discriminatory employment practices as forbidden by the Iowa Civil Rights Act of 1965. These provisions shall be fully enforced, as directed through Executive Order Number 34 dated July 22, 1988. Any breach of the provisions contained in the Iowa Civil Rights Acts of 1965 shall be regarded as a material breach of contract.
- Bidder agrees that if awarded a contract to construct and/or remodel any portion of the project described in these Specifications, neither the contractor nor any subcontractors will engage in any discriminatory employment practices based on race, color, creed, religion of natural origin and that they will in all contracts comply with all statutes of the State of Iowa against discrimination. Failure to do so could be deemed a material breach of contract.

3.9 Public Contract Termination:

The provisions of Iowa Law as contained in Chapter 573A of the Code of Iowa, an Act to provide for termination of contracts for the construction of public improvements when construction or work thereon is stopped because of national emergency, shall apply to and be a part of this Contract, and shall be binding upon all parties hereto, including sub-contractors and sureties upon any bond given or filed in connection herewith.

Introductory Information

**PROJECT MANUAL FOR:
CONTRACT 233AG
REST AREA STANDBY GENERATORS
SCOTT COUNTY REST AREA - WEST BOUND
PROJECT NO. IMN-80-8(262)299--0E-82**

CERTIFICATION

PROJECT

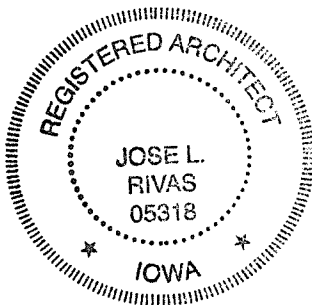
IDOT 233AG
Rest Area Standby Generators

ARCHITECT

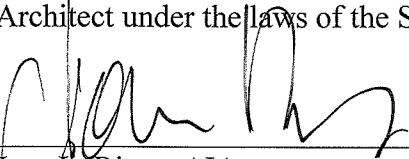
Yaggy Colby Associates
Mason City, Iowa and
717 Third Avenue SE
Rochester, MN 55904

Telephone: (507) 288-6464
Fax: (507) 288-5058

(SEAL)



I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly registered Architect under the laws of the State of Iowa.


Jose L. Rivas, AIA
License #05318

5/21/09
(Date)



My License renewal date is 06/30/11

Pages or sheets covered by this seal: Division 03.

LANDSCAPE ARCHITECT

Yaggy Colby Associates
215 North Adams
Mason City, IA 50401

Telephone: (641) 424-6344
Fax (641) 424-0351

<p>(SEAL)</p>  <p>A circular professional seal for Monte A. Appelgate, ASLA, License #342. The seal features the text "STATE OF IOWA" at the top, "MONTE A. APPELGATE" in the center, "LANDSCAPE ARCHITECT" below it, and "REGISTERED LANDSCAPE ARCHITECT" around the bottom edge. The number "342" is at the bottom center.</p>	<p>I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly registered Landscape Architect under the laws of the State of Iowa.</p> <p> <u>5/21/09</u> Monte A. Appelgate, ASLA (Date) License #342</p> <p>My License renewal date is 06/30/10</p> <p>Pages or sheets covered by this seal: Division 32.</p>
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CIVIL ENGINEER

French-Reneker-Associates, Inc.
1501 South Main Street
Fairfield, IA 52556

Telephone: (641) 472-5145
Fax: (641) 472-2653

(SEAL)



I hereby certify that this engineering document was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Iowa.

David H. Fredericks 5/21/09
David H. Fredericks, PE (Date)
License #9336


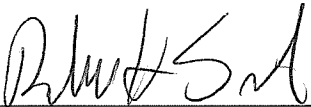
My License renewal date is 12/31/09

Pages or sheets covered by this seal: Divisions 02 and 31.

MECHANICAL/ELECTRICAL ENGINEER

Brown Engineering Company
5525 Meredith Drive, Suite D
Des Moines, IA 50310

Telephone: (515) 331-1325
Fax: (515) 331-1375

<p>(SEAL)</p> 	<p>I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.</p> <p> Robert H. Sieh, PE License #15377</p> <p>5-21-09 (Date)</p> <p>My license renewal date is 12/31/09</p> <p>Pages or sheets covered by this seal: Division 26.</p>
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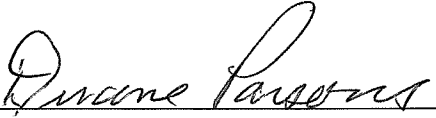
<p>(SEAL)</p> 	<p>I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.</p> <p> Duane P. Parson, PE License #10520</p> <p>5/21/09 (Date)</p> <p>My license renewal date is 12/31/09</p> <p>Pages or sheets covered by this seal: Division 23.</p>
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DIVISION 02

EXISTING CONDITIONS

SECTION 02 01 00

MAINTENANCE OF EXISTING CONDITIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Maintain operation of existing rest area facilities, sidewalks, and utility services.
 - 2. Contractor shall notify the Iowa DOT, Division of Maintenance Services, 24 hours (minimum) in advance of when he plans to be on-site and performing work.
- C. Related Sections of Work;
 - 1. Demolition: Section 02 41 00

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide all barricades, fences, and warning lights as required to protect persons and property in accordance with all applicable Iowa DOT specifications and regulations.

PART 3 EXECUTION

3.01 INSPECTION

- A. Locate existing utilities in areas of work before starting operations under this section. Use all means necessary to provide protection from damage during construction operations.
- B. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Engineer immediately for directions as to procedure. Cooperate with Owner and public and private utility companies in keeping services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

3.02 PROCEDURE

- A. Maintaining Traffic:
 - 1. Ensure minimum interference with roads, driveways, sidewalks, and adjacent facilities.

2. Do not close or obstruct roads, driveways, and sidewalks without permission from authorities having jurisdiction.
3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

B. Maintaining Utilities:

1. LP Gas Service and electrical service are essential to the operations of the rest area.
 - a. It will be necessary to shut down these services during construction. These shut downs shall be limited to two (2) hours per occurrence.
 - b. Contractor shall notify the Iowa DOT, Division of Maintenance Services, 48 hours (minimum) in advance of shutting down these services.

END OF SECTION

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Remove existing landscaping as indicated.
 - 2. Remove existing PCC sidewalk as indicated.
 - 3. Remove/abandon existing utilities as indicated.
- C. Related Sections and Work:
 - 1. Excavating, Stripping Topsoil, Filling, Grade: Division 31.
 - 2. Capping of Mechanical and Electrical Items: Divisions 23 and 26 – coordinate the proper local utility.

1.02 PROTECTION

- A. All remaining portions of property and utilities not scheduled for demolition shall be completely protected during demolition and removal of debris. Any resulting damage shall be repaired or replaced to like new condition by the Contractor responsible.

1.03 OCCUPANCY

- A. The rest area facilities shall remain open at all times.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide all barricades, fences, and warning lights as required to protect persons and property in accordance with all applicable Iowa DOT Specifications and regulations.

PART 3 EXECUTION

3.01 INSPECTION

- A. Prior to commencing the work installed under this section, examine the areas and conditions under which the work of this section will be performed. Notify the Engineer, in writing, of unacceptable conditions that exist, prior to acceptance.

3.02 CLEARING/PROCEDURE

- A. In all activities, comply with pertinent regulations of governmental agencies having jurisdictions.
- B. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- C. Demolition construction to be removed:
 - 1. Demolish completely and remove from the site.
 - 2. Use such methods as required to complete the work within the limitations of governing regulations.
 - 3. Break up and remove concrete slabs on grade as noted on drawings.
 - 4. Pollution Control:
 - a. Provide water sprinkling, temporary enclosures and other suitable methods as may be required to limit the amount of dust and dirt rising and scattering in the air to the lowest level of air pollution practical for the work conditions.
 - b. Comply with all governing regulations.
 - c. Clean adjacent structures and other improvements of all dust, dirt, and debris caused by demolition operations as directed by the Engineer.
 - d. Return all areas to conditions existing prior to start of the work of this section.
- D. Disposal of Materials:
 - 1. No demolition material is scheduled for reuse.
 - 2. All demolition material shall become property of the Contractor and shall be removed from the Owner's site by the Contractor. No prolonged accumulation of debris will be allowed.
 - a. Remove all demolition material from the site as removed. Storage or sale of removed items on the site will not be allowed.

3.03 CLEAN UP/ACCEPTANCE

- A. Clean up trash and debris caused by clearing operations under this section, keeping premises clean and neat at all times.

END OF SECTION

DIVISION 03

CONCRETE

SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Provide formwork for all cast-in-place concrete including formwork for concrete bases for equipment of mechanical and electrical divisions, if applicable. Contractors for Divisions 21, 22, 23, and 26 shall be responsible for size, location and required inserts.
 - 2. Install all inserts, sleeves, bolts and similar items required for the work of other sections.

1.02 RELATED SECTIONS AND WORK

- A. Furnishing of inserts, sleeves, bolts and similar items of other sections which are built into the work of this section.
- B. Exterior concrete pads for mechanical and electrical equipment: Respective Divisions 21, 22, 23, and 26.

1.03 QUALITY ASSURANCE

- A. American Concrete Institute (ACI)
 - 1. ACI 347, Recommended Practice for Concrete Formwork.
 - 2. ACI 301, Specifications for Structural Concrete for Buildings
 - a. Tolerances are not cumulative, 1/8" max.
 - 3. ACI 318 - Building Code requirements for Reinforced Concrete.
 - 4. PS 1 - Construction and Industrial Plywood.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Removable Forms:
 - 1. Forms for Exposed Finish Concrete: Unless otherwise shown or specified, construct formwork for concrete surfaces, which will be exposed to view in the completed project, with plastic coated plywood, metal, metal-framed plastic coated plywood or other acceptable panel-type materials, to provide continuous,

straight, smooth exposed surfaces. Furnish in largest practicable sizes to minimize number of joints.

- a. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
2. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed to view in the completed project with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
3. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces to be cured with water or curing compound.

B. Embedded Items, Accessories:

1. All anchor bolts, inserts, plates, angles, sleeves, nailing blocks, etc., whether furnished as specified under this division, or other divisions, furnished by other trades or by the Owner shall be installed by this Contractor. Anchor bolts, unless specifically furnished by others, will be furnished by this Contractor. Suitable templates will be constructed and used to accurately set and support against displacement all bolts, inserts, sleeves, etc.
2. Conduits and Pipes: This Contractor shall be responsible for controlling the proper placing of all embedded pipe, conduit and other fixtures. ACI 318, Article 6.3 shall apply to all cause of embedded fixtures.
3. Corner Formers: Provide 45 degrees corner formers (chamfer) on all exposed external corners and exposed edges in the final project.

C. Form Ties:

1. For unexposed concrete: Adjustable length removable or snap-off type which will leave holes no larger than 1" in diameter in face of concrete and when forms are removed no metal will be within 1" of finished concrete surface.
2. For exposed concrete:
 - a. Cone type, length and size required, with removable plastic cone, which when removed will leave clean, neat hole 1" dia. and approximately 1 1/2" deep.
3. No wire ties or site fabricated ties permitted.

PART 3 EXECUTION

3.01 INSTALLATION

A. Form Construction:

1. General: Construct forms complying with ACI 347, to the exact sizes, shapes, lines and dimensions shown and as required to obtain accurate alignment, location, grades, level and plumb work in the finished structures.
2. Design, engineering and proper construction of forms, shoring and bracing is the responsibility of the Contractor. Include all factors pertaining to safety of

formwork structure such as live load, dead load, weight of equipment on formwork, concrete mix, height of concrete drop, vibration reactions and similar factors.

3. Construct formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.
4. Construct formwork, brace, shore, tie forms to maintain position and shape true and straight without deflection.
5. Coat forms in accordance with manufacturer's recommendations to provide for removal of forms without damaging surface of finished concrete prior to placing reinforcement.
 - a. Do not coat construction joints.
 - b. Excess coating material shall not be allowed to stand in puddles in the forms nor allowed to come in contact with concrete against which fresh concrete will be placed.
 - c. Do not coat permanent forms.

B. Earth Forms:

1. Side forms for footings may be omitted and concrete may be placed directly against excavation, only when requested by the Contractor and approved in writing by the Engineer.
2. When omission of forms is accepted, provide additional concrete 1" on each side of the minimum design profiles and dimensions shown on the drawings.

C. Removal of Forms:

1. Remove forms in a manner and at such time to insure complete safety of the structure. In no case shall supporting forms or shoring be removed until sufficient strength has been obtained to support weight and load.
 - a. Results of job-cured cylinders (ASTM C 31) shall be used as evidence that concrete has obtained required strength.
2. Remove in manner that will not damage concrete or adversely affect appearance of exposed concrete members.
3. Coordinate removal with work of other trades.
4. Completely remove all wall ties, leaving clean cut holes without disfigurement of concrete.

D. Tolerances: Tolerances for construction of cast-in-place concrete work shall be as follows:

1. General: Tolerances of any kind permitted in construction shall not relieve the Contractor of providing the design indicated or fitting the different materials together properly for continuity of construction, proper function of building.
2. Footings:
 - a. Variation of dimensions in plan: +2", -1/2"
 - b. Variation of center from specified center in plan: 2 percent of footing width in direction of variation, plus or minus 2" maximum variation.
 - c. Variation of bearing surface from specified elevation: plus or minus 1/2".
3. Piers, Columns and Walls:

- a. Variation in cross-sectional dimensions of piers and columns and in thickness of walls: plus or minus 1/4".
- b. Variation in plan from specified location in plan: plus or minus 1/2" any member, any location.
- c. Deviation in plan from straight lines parallel to specified linear building lines.
 - 1) 1/40" per foot, adjacent members less than 20' apart or any wall length less than 20'.
 - 2) 1/2" adjacent members 20' or more apart or any wall length of 20'.
- d. Deviation from Plumb:
 - 1) 1/4" any 10' of height.
 - 2) 1" maximum for the entire height.
- e. Variation in elevation from specified elevation: plus or minus 1/2", any member, any location.
- f. Deviation in elevation from lines parallel to specified grade lines.
 - 1) 1/40" per foot, adjacent members less than 20' apart or any wall length less than 20'.
 - 2) 1/2" adjacent members 20' or more apart or any wall length of 20'.
- 4. Anchor Bolts and Sleeves:
 - a. Variation from specified location in plan: plus or minus 1/4".
 - b. Variation from specified elevation: plus or minus 1/2".
- 5. Deviation from Drainage (Pitch) Slope:
 - a. Tolerances of any kind permitted in construction shall not relieve the Contractor of providing uniform drainage pitch or slope (without areas that cause ponding) where indicated by note, elevation differences or design.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Fabrication and Placement of Reinforcement For:
 - a. Cast-In-Place Concrete
 - b. Structural Concrete
 - c. Including bars, welded wire fabric, ties, supports and accessories required.
 - 2. Furnishing bars for reinforced masonry.
 - 3. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site.
 - 4. Contractor is responsible for the fabrication processes, techniques of construction, coordination of his work with that of all other trades, and the satisfactory performance of his work.

1.02 QUALITY ASSURANCE

- A. American Concrete Institute (ACI)
 - 1. ACI 318, Building Code Requirements for Reinforced Concrete.
- B. Concrete Reinforcing Steel Institute (CRSI), American Society for Testing and Materials (ASTM), American Welding Society (AWS), American National Standards Institute (ANSI).
 - 1. Manual of Standard Practice
 - 2. ACI 301 - Structural Concrete for Buildings
 - 3. ACI SP-66 - American Concrete Institute - Detailing Manual
 - 4. ANSI/ASTM A 82 - Cold Drawn Steel Wire for Concrete Reinforcement
 - 5. ANSI/ASTM A 185 - Welded Steel Wire Fabric for Concrete Reinforcement
 - 6. ANSI/ASTM A 497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement
 - 7. ANSI/AWS D 1.4 - Structural Welding Code for Reinforcing Steel
 - 8. ASTM A 615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement
 - 9. ASTM A 706 - Low Alloy Steel Deformed Bars for Concrete Reinforcement
 - 10. AWS D 12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction
 - 11. CRSI - Placing Reinforcing Bars

1.03 SUBMITTALS

- A. Shop Drawings: If required by Engineer.
 - 1. Submit complete shop and setting drawings. Include reinforcing for all concrete and masonry work.
 - 2. Show reinforcing size, length, bending details, spacing, and methods of supporting reinforcing. Provide details as necessary to show final position of reinforcement in elements. Show all walls in plan and elevation.
 - 3. Engineer's review of shop drawings will be for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Compliance with the requirements for materials, dimensions, fabrication, and erection is the Contractor's responsibility.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver all bars to job site, bundled in manageable units and properly tagged to permit inspection identification.
- B. Do not exceed capacity of existing construction or formwork.
- C. Store reinforcing clear of ground and avoid contact with mud, grease, or other materials which would affect bond.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Reinforcing Steel:
 - 1. All Reinforcing Bars: ASTM A 615, Grade 60, deformed as per ASTM specifications.
 - 2. Welded Smooth Wire Fabric: ASTM A 185 welded steel wire fabric for concrete reinforcement, size as noted on drawings. Minimum 6" x 6": 1.4W x 1.4W Welded Wire Fabric.
 - 3. Dowels: Plain round rolled steel bars, ASTM A 306, Grade 80.
- B. Accessories:
 - 1. Chairs and spacers: Metal stock designed for purpose intended.
 - 2. Comply with CRSI "Recommended Practice for Placing Bar Supports, Specifications and Nomenclature".
 - 3. Provide galvanized or plastic tipped accessories in contact with forms for sight exposed concrete; stainless steel accessories for sandblasted or bush-hammered concrete.
 - 4. Wire: Plain, cold-drawn steel wire, ASTM A 82.

2.02 FABRICATION

- A. General: Fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI Manual of Standard Practice. In case of fabricating errors, do not rebend or straighten reinforcement in a manner that will injure or weaken the material.
- B. Unacceptable Materials: Reinforcement with any of the following defects will not be permitted in the work:
 - 1. Bar lengths, depths and bends exceeding specified fabrication tolerances.
 - 2. Bend or kinks not indicated on drawings or final shop drawings.
 - 3. Bars with reduced cross-section due to excessive rusting or other cause.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Comply with the specified codes and standards and Concrete Reinforcing Steel Institute recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified and noted on the structural drawings.
 - 1. Clean reinforcement to remove loose rust and mill scale, earth, ice and other materials which reduce or destroy bond with concrete. Metal reinforcement with rust, mill scale or a combination of both shall be considered as satisfactory, provided the minimum dimensions, including height or deformations and weight of hand wire brushed test specimen, are not less than the applicable ASTM specification requirement.
 - 2. Position, support and secure reinforcement against displacement by formwork, construction or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.
 - 3. All splicing of bars, concrete cover, placing tolerances and bar spacings shall conform to Building Code Requirements for Reinforced Concrete (ACI 318), as published by the American Concrete Institute and to recommended practices in Reinforcing Bar Splices by the Concrete Reinforcing Steel Institute. Splices not detailed require approval of the Engineer prior to placing concrete.
 - 4. Place reinforcement to obtain the minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports together with 16 gauge wire to hold reinforcements accurately in position during concrete placement operations. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.
 - a. Protect reinforcement by concrete as follows unless otherwise detailed:
 - (1) Where concrete is exposed to weather or to ground, but placed in forms: not less than 2" for bars more than 5/8" diameter and 1 1/2" for bars 5/8" or less in diameter.
 - 1) Concrete covering or reinforcing in footings: 3" clear on bottom and sides.

- (2) All other concrete: cover reinforcement a minimum of 3/4" for slabs and walls and 1 1/2" from floor penetrations and beam faces.
- 5. Coordinate and cooperate with other trades to insure that all reinforcing is in proper place and that all pipes, sleeves, conduit, anchors, bolts, flashings, caulking grooves, slips and other inserts of other trades to be cast into concrete are securely placed before concrete is placed.
- 6. Install welded wire fabric in as long lengths as practicable, cut to fit all penetrations. Lap wire mesh in structural slabs so that full, uncut squares of mesh of both sheets lap each other at least 1 1/2 times or 12", whichever is greater. Lap wire mesh in slabs on grade and topping slabs so that full, uncut squares of mesh of both sheets lap each other at least 1/2 times or 6", whichever is greater. Lap splices with 16 gauge wire or clip together with standard metal clips. Place mat flat, without roll or curling.
 - a. Unless otherwise indicated, reinforce all concrete floor slabs, precast plank topping, concrete decks on permanent forms, walks, drives and all exterior slabs on grade with 6" x 6": 1.4W x 1.4W welded wire fabric.
- 7. Provide sufficient numbers of supports and of strength to carry reinforcement. Do not place reinforcing bars more than 2" beyond the last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.
- 8. No bars shall be placed while concrete is being poured.
- 9. No bars shall be bent after being partially embedded in hardened concrete.
- 10. No welding of reinforcing steel shall be permitted without prior written authorization by the Engineer.
- 11. Provide concrete masonry walls with full height vertical reinforcing where noted on plans.
 - a. Provide the same vertical reinforcement at all door jambs, corners, control joints and each side of columns.

3.02 FIELD QUALITY CONTROL

- A. Notify Engineer when reinforcing is in place so that a review of reinforcement placement can be made prior to placement of concrete.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Provide all cast-in-place concrete including masonry fill, setting of fence posts, and like items.
 - 2. Install anchor bolt inserts and similar items furnished by other trades.
 - 3. Contractor for this section of work shall coordinate all phases of the concrete work to completion.

1.02 RELATED SECTIONS

- A. Section 03 10 00 – Concrete Forming and Accessories
- B. Section 03 20 00 – Concrete Reinforcing
- C. Furnishing of anchor bolts, inserts and similar items required by other trades.
- D. Exterior (exterior only), concrete bases for equipment of mechanical and electrical – Divisions 21, 22, 23, and 26.

1.03 QUALITY ASSURANCE

- A. Reference Standards for Design and Construction
 - 1. American Concrete Institute (ACI)
 - a. ACI 301, 84, Specifications for Structural Concrete for Buildings
 - b. ACI 304, Concrete Placement
 - c. ACI 305, Recommended Practice for Hot Weather Concreting
 - d. ACI 306, Recommended Practice for Cold Weather Concreting
 - e. ACI 318, Building Code Requirements for Reinforced Concrete
 - 2. American Society for Testing and Materials (ASTM)
 - a. ASTM C 31, Making and Curing Concrete Test Specimens in the Field
 - b. ASTM C 33, Standard Specification for Concrete Aggregates
 - c. ASTM C 94, Standard Specification for Ready-Mixed Concrete
 - d. ASTM C 143, Test Method for Slump of Portland Cement Concrete
 - e. ASTM C 150, Standard Specification for Portland Cement

- f. ASTM C 171, Standard Specification for Sheet Materials for Curing Concrete.
 - g. ASTM C 260, Standard Specification for Air-Entrained Admixtures for Concrete.
 - h. ASTM C 309, Standard Specification for Liquid Membrane-Forming Compound for Curing Concrete.
 - i. ASTM C 330, Standard Specification for Lightweight Aggregates for Structural Concrete
 - j. ASTM C 494, Standard Specification for Chemical Admixtures for Concrete.
 - k. ASTM C 979, Standard Specification for Pigments for Integrally Colored Concrete.
- B. Other portions of this Section 03 30 00 contain requirements and information related to ACI Standards and ASTM Standards; in case of conflict between these standards and this section, the requirements of this Section 03 30 00 shall govern.
- C. Testing:
 - 1. See Article 1106.02, Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation.
 - 2. The concrete furnished under this section of work shall be the strength as indicated in PART 3 - EXECUTION and the tests listed in PART 3 - FIELD QUALITY CONTROL are required. These tests will be provided by the Owner.

1.04 SUBMITTALS

- A. Comply with requirements of field quality control testing listed in PART 3 - EXECUTION.
- B. Concrete Mix Design:
 - 1. General Requirements: The Contractor, at his expense, shall employ the services of an independent testing laboratory to test the proposed aggregate and design concrete mixes for each type of concrete required.
 - a. Submittal and approval of mix design: Aggregate test reports and mix design shall be submitted to the Engineer and structural engineer in duplicate for approval at least 14 days prior to placing of concrete. No concrete will be allowed to be placed until the aggregate test reports have been reviewed and mix designs approved by the Engineer.
 - b. Testing of Aggregate: Each type of fine course aggregate to be used shall be completely tested in accordance with the requirements of ASTM C 33, latest edition, and these specifications. Lightweight aggregate shall be tested in accordance with the requirements of ASTM C 330, latest edition.
 - c. Use of reports from other projects: Reports of tests made for other projects may be submitted; however, such tests shall be representative of

1)	Gradation	ASTM C 136-71 and C 117-69
2)	Organic Impurities	ASTM C 40-73
3)	Friable Particles	ASTM C 142-71
4)	Coal and Lignite	ASTM C 123-69

- ## 1.05 WEATHER CONDITIONS

- ### Cast-In-Place Concrete

heating is provided. In no case shall concrete be exposed to freezing temperatures for 72 hours after placing.

3. Maintain concrete temperature not less than 50° F nor more than 90° F for the first three days after placing. Protect from freezing for the next five days.

H. Hot Weather Protection:

1. Perform all hot weather concreting in accord with ACI - 605 - "Recommended Practice for Hot Weather Concreting".
2. Thorough wet dry porous surfaces before concreting.
3. Maintain concrete temperature not less than 50° F no more than 90° F for the first three days after placing. Protect from temperatures over 90° F for the next five days.

PART 2 PRODUCTS

2.01 MATERIALS

A. All Concrete Materials shall be from Iowa Department of Transportation approved sources:

1. Portland Cement: ASTM C 150, Type 1
2. Aggregate:
 - a. Applicable Standard: ASTM C 33
 - b. Aggregate shall be hard-coated gravel or crushed stone, maximum size 1/5 narrowest dimension between reinforcing rods. Sizes as follows:
 - 1) Footing: 1 1/2" maximum
 - 2) Fill for masonry: 3/8" maximum
 - 3) All other concrete: 3/4" maximum
 - c. Sand: ASTM C 33, clean, hard uncoated grain, free from loam, clay and silt.
3. Water: Clean, potable and free of deleterious amounts of acids, alkalis and organic materials.

2.02 CONCRETE ADMIXTURES

A. All Concrete Admixtures shall be Iowa Department of Transportaion approved sources.

B. Air Entraining Admixtures: Use in all concrete exposed to the weather and as specified for quality of concrete used, ASTM C 260.

1. "Aerolith", Sonneborn Building Products, Inc.
2. "Sika-AEA", Sika Chemical Corp.
3. "Darex AEA", W. R. Grace and Company
4. Engineer approved equivalent

- C. Water Reducing Admixture: ASTM C 494, Type A, and not containing more chloride ions than municipal drinking water. Acceptable manufacturers:
 - 1. Euclid Chemical Company - Eucon WR-75
 - 2. Sika Chemical Corp. - Plastocrete 160
 - 3. Master Builders - Pozzoloth 200N
 - 4. Engineer approved equivalent
- D. Non-Chloride Accelerators: ASTM C 494, Type C or Type E, and not containing more chloride ions than municipal drinking water. Acceptable manufacturers:
 - 1. Sika Chemical Corp. - Sikacrete
 - 2. W. R. Grace - Darex Set Accelerator
 - 3. Master Builders - Pozzoloth 122-HE
 - 4. Engineer approved equivalent.
- E. Calcium chloride is prohibited
- F. Fly Ash: ASTM C 618 at Contractor's option

2.03 MISCELLANEOUS MATERIALS

- A. Liquid Curing and Sealing Compound: Acrylic base, ASTM C 309, Type I, containing a minimum of 18% solids.
 - 1. Performance Requirements:
 - a. Contains no wax, oils, salts or other ingredient that is detrimental to bonding concrete topping, sealants, resilient tile, paint or other specified finish being applied to concrete.
 - b. Contains no ingredient which stains or discolors concrete permanently.
 - 2. Acceptable Manufacturers:
 - a. Euclid Chemical Company - Rezseal
 - b. Sonneborn - Kur-N-Seal
 - c. Tamms Industries Co. - SC Seal Cure 18
 - d. Engineer approved equivalent
- B. Bonding Compound: Polyvinyl acetate, rewettable type.
 - 1. Acceptable manufacturers:
 - a. Euclid Chemical Company - Euco Weld
 - b. Tamms Industries Co. - Lab Liquid Adhesive Bond
 - c. L&M Construction Chemicals - Everweld
 - d. Engineer approved equivalent
- C. Expansion joint filler: Performed, resilient, non-extruding asphalt impregnated cane fiber conforming to ASTM D 1751, Exterior Use ASTM D 1752, Federal Specifications HH-F-341E, Type 1.

1. Size:
 - a. Use 1/4" thick x depth of slab for all interior slabs on grade (not exposed to the elements.)
 - b. Use 1/2" thick unless shown otherwise x depth of slab.
- D. Patching Concrete: Same materials and proportions as the concrete used except.
 1. Omit coarse aggregate.
 2. Use no more than one part cement to 2-1/2 parts sand by damp, loose volume.

2.04 FABRICATION

- A. Concrete Type and Strength: Concrete shall have a minimum compressive strength, in place, at 28-days as follows:
 1. Exterior concrete slabs on grade, footings, foundation walls, and retaining walls: 4,000 psi with entrained air.
 2. Masonry Fill/Grout: 2,000 psi
 3. Masonry Bond Beams: 3,000 psi
 4. All other Concrete: 3,000 psi
- B. Slump: Concrete slump be as determined by ASTM C 143 and shall be as follows:
 1. Slabs-on-Grade Foundation walls and retaining walls: 3" maximum.
 2. Footings: 3" to 4"
 3. Masonry fill/grout for reinforced cores and piers: 5" to 8"
- C. Water-Cement Ratio: All exterior concrete exposed to weather shall have a water-cement ratio of not more than 0.44. All other concrete shall have a maximum ratio of 0.53.
- D. High-Early Strength Concrete: Contractor may use Type III Portland Cement to produce high-early strength concrete. Adding additional amounts of Type I Portland Cement to product high-early strength concrete will not be permitted.
- E. Brand of Cement: Only one brand of Portland Cement shall be used. The same brand and type, normal or high-early strength, of Portland Cement shall be used for all concrete to have an architectural finish.
- F. Workability: Concrete consistency shall be such that concrete will fill forms without voids or honeycombs, completely embed and bond to reinforcing without permitting materials to separate, and not promote excess water to collect on surface.

G. Admixtures:

1. Entrained air: All exterior concrete exposed to weather shall be air-entrained. Proportions of entrained air, as determined by ASTM C 138, ASTM C 173 or ASTM C 231, shall be 5-7 percent by volume for concrete with 3/4" maximum nominal size coarse aggregate.
2. Water Reducing Admixture: Provide in all concrete.
3. Non-Corrosive Accelerator: Provide in concrete slabs placed when below 50° F.
4. Calcium Chloride: Not permitted
5. Fly Ash: ASTM C 618, Type C, Contractor's option per mix design. Not to exceed 15% by weight substitution for Portland Cement.

H. Concrete Mixing:

1. General: All concrete required shall be ready-mix concrete and shall be provided by an Iowa Department of Transportation approved ready-mix concrete facility.
2. Ready-Mixed Concrete:
 - a. Applicable Standard: Concrete shall be mixed and delivered in accordance with ASTM C 94.
 - b. Source: Source of ready-mix concrete shall be approved by Engineer.
 - c. Agitating: Agitate concrete materials continuously from time materials are placed in mixer until concrete is discharged.
 - d. Tempering: No additional water shall be added to mix after truck leaves batching plant without approval of Engineer.
 - e. Departure Certification: Each truck shall have time of departure from batching plant stamped on ticket.
 - f. Delivery Time: There shall be a maximum of 1-1/2 hours between time concrete mix is placed in truck and placing of concrete in forms. When air temperature is between 85° F and 90° F, maximum delivery time shall be 75 minutes. When air temperature is above 90° F, maximum delivery time shall be 60 minutes.

PART 3 EXECUTION

3.01 INSTALLATION

A. Preparation before Placing Concrete:

1. General: Before concrete placement, formwork shall be completed, elevations verified, slope or drainage verified, snow, ice and water and other debris shall be removed, reinforcement shall be secured in place, and expansion joint materials shall be positioned.
 - a. Preparation of Subgrades: Sprinkle semi-porous subgrades sufficiently to eliminate suction. Do not place concrete on frozen ground, on soft mud, or dry porous earth.

2. Cleaning Equipment: Remove hardened concrete and foreign materials from inner surface of conveying equipment.
3. Verify completion of all other work to be covered or enclosed by the concrete.

B. General:

1. Conveying Concrete: Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.
2. In joining fresh concrete to concrete that has already set, remove all loose and foreign materials from set concrete. Scrub with wire brooms and thoroughly clean. Moisturize when the new concrete is placed.
3. Exercise care in placement of concrete for slabs on grade over vapor barrier. Avoid puncturing or tearing vapor barrier during transportation and placement.

C. Placing Concrete:

1. Placing Exterior Slabs and Sidewalks:
 - a. Shelter Slabs Subgrade: Place shelter slabs on a minimum 12" thick compacted granular fill.
 - b. Thickness and reinforcing as shown on drawings.
 - 1) Minimum concrete (slab) thickness 6".
 - 2) Minimum reinforcing as indicated on Drawings.
 - c. Finish: Broomed finish unless otherwise indicated. After floating, troweling and when water sheen has disappeared, brush lightly with approved steel or fiber broom, to a uniform roughened surface. Brooming shall be at right angle to the centerline of walks and always in one direction of large continuous areas.
 - d. Expansion Joints: 1/2" pre-molded bituminous filler in locations detailed and at intervals not exceeding 30' in any direction.
 - e. Slope: Slope all exterior concrete slabs in a manner to prevent the collection of water.
 - f. Construction of Portland Cement Concrete sidewalks shall conform to Section 2511 of the Iowa DOT Standard Specifications.
 - g. Concrete shall be Class C concrete produced and placed in accordance with Section 2301 and Article 4115.04, Paragraph C, Iowa DOT Standard Specifications.
 - h. Course aggregate shall be Class 3i Durability.

- D. Consolidated Concrete:
1. General: Consolidate concrete by vibrating, spading, rodding or forking so that concrete is thoroughly worked around reinforcement, around embedded items, and into corners of forms to eliminate air or stone pockets which may cause honeycombing, pitting or planes of weakness. Use competent workmen under competent supervisors.
- E. Joints in Concrete:
1. Locate construction joints as indicated on drawings, or as approved by the Engineer.
 - a. Place joints perpendicular to the main reinforcement.
 - b. Refer to drawings for control and construction joints
 2. Expansion Joints: Refer to drawings and/or install whenever slabs abut vertical surfaces ACI 301.
 3. Contraction Joints: Refer to drawings for details and spacing notes.
- F. Pipe Sleeves and Embedded Items:
1. Before pouring any concrete, determine that all embedded metal pipe sleeves, anchors, anchor slots, anchor bolts, hangers, concrete inserts, and similar items are firmly secured and fastened in place and that all embedded items required of other divisions have been furnished and installed.
- G. Repairing and Patching: Remove and replace at no additional cost any concrete not formed as shown on plans, concrete out of alignment, surfaces beyond required tolerances or defective surfaces which cannot be properly repaired or patched, including any concrete failing to meet the strength requirements as determined by the testing laboratory.

3.02 CURING

- A. Protect concrete from premature drying. Provide temporary housing, covering, or other protection used in curing and keep in place and intact a minimum of 24 hours after artificial heating or cooling has been discontinued. Follow finishing operations with curing measures within two hours.
- B. Keep concrete continuously moist for 7 days. Prevent rapid drying at the end of the curing period. Accomplish cure by one of the following methods:
1. Ponding or continuous sprinkling.
 2. Absorptive mats or fabrics kept continuously wet.
 3. Non-staining waterproof paper as specified. Keep all joints airtight and weighted in place.
 4. Non-staining polyethylene film as specified. Keep all joints weighted to prevent wind penetration.

3.03 FIELD QUALITY CONTROL

- A. Comply with pertinent provisions of Article 1106.02, Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation.
- B. Work installed under this section shall be performed under the supervision of a capable foreman, in conformance with the standards referenced above.
- C. Testing: Owner will hire a Testing Agency to perform the following tests:
 - 1. Slump Tests:
 - a. Test Procedure: Maintain a slump cone on job during all concreting operations. Conduct slump tests in accordance with ASTM C 143.
 - 2. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one test for each set of compression test specimens.
 - 3. Compression Tests of Concrete Cylinders:
 - a. Cost Responsibility for Tests: Owner will have concrete test cylinders tested by a testing laboratory supervised by a professional Engineer licensed in the state of Iowa, and shall pay all costs of taking samples and performing the tests. Test cylinders shall be made in accordance with the "Standard Method of Making and Curing Concrete Compression and Flexure Test Specimens in The field" (ASTM C 31.) for compliance with specified strength.
 - b. Frequency of Testing: Take two sets of three test cylinders for every concrete placement and not less than two sets of three test cylinders for each additional 50 cubic yards of concrete placed. The first set of cylinders shall be considered control cylinders and shall be laboratory cured at 70° F. Of the control set, one cylinder shall be tested at 7 days, one at 28 days, and the third cylinder shall be tested only if 28-day cylinder failed. The second set of cylinders shall be job cured and used to determine when forms and shoring may be removed. The first of these cylinders shall be tested at 7 days and the other two cylinders tested only if required.
 - c. Number of Tests Per Set: Each set of test cylinder shall consist of three concrete test cylinders, 6" x 12" and each set shall be considered as one test. All cylinders in each set shall be taken from the same batch of concrete. Contractor shall note date, location and concrete slump on each cylinder made.
 - d. Location of Making Cylinders: Concrete test cylinders shall be made at discharge end of chute, slide or pipe and not at truck or mixer.
 - e. Strength Requirements: The strength level of the concrete will be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength f'c and no individual strength test result falls below the specified strength f'c by more than 500 psi.

- f. Compression Test Failure: Failure of concrete compression tests to meet specified strength will require a load test or test cores at Contractor's expense. Failure to meet required live and dead loads or meet strength requirements of cores shall constitute rejection or consideration for rejection by the ENGINEER. Cost of measures to make work satisfactory shall be paid by Contractor.
- 4. Reports:
 - a. Submit test result reports to Engineer.

END OF SECTION

DIVISION 23

HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

SECTION 23 00 00
HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Furnish all labor, materials, tools, equipment, scaffolding, transportation, permits, inspection certificates and temporary protection necessary to complete installation of all work as shown on Project Drawings and/or called for in these specifications. Drawings and specifications shall be considered mutually coordinate, and any material included in one but not the other shall be furnished as though required in both. All material necessary to provide a complete working installation shall be furnished whether mentioned or not.
- B. Before turning equipment over to the Owner, the Contractor shall thoroughly test equipment and instruct the Owner or his representative in its operations and maintenance.

1.02 CODES AND STANDARDS

- A. Comply with the latest applicable codes and standards as set forth by the following:

AGA	American Gas Association
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute, Inc.
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
DNR	Department of Natural Resources, State of Iowa
EPA	U.S. Environmental Protection Agency
MCA	Mechanical Contractors Association
MSS	Manufactures Standardization Society
NADCA	National Air Duct Cleaners Association
NBS	National Bureau of Standards
OSHA	Occupational Safety and Health Act
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
	State and Local Codes and Ordinances

- B. If there is a discrepancy between the codes and regulations having jurisdiction over this installation and these specifications, the Engineer shall determine the method or equipment used.
- C. If the Contractor notes, at the time of bidding, any parts of the drawings and specifications which are not in accordance with applicable codes or regulations, he shall inform the Engineer in writing, requesting a clarification. If there is insufficient time to follow this procedure, he shall submit with his proposal a separate price required to make the system shown on the drawings comply with the codes and regulations.
- D. All changes to the system made after the letting of the contract, in order to comply with the applicable codes or the requirements of the Inspector, shall be made by the Contractor without cost to the Owner.

- E. If there is a discrepancy between the manufacturer's recommendations and these specifications, the manufacturer's recommendations shall determine the method or equipment used.

1.03 PERMITS, FEES, TAXES, INSPECTIONS

- A. Procure all applicable permits and licenses.
- B. Abide by all applicable laws, regulations, ordinances, and other rules of the State or Political Subdivision wherein the work is done, or as required by any duly constituted public authority.
- C. Pay all applicable charges for such permits or licenses that may be required.
- D. Pay all applicable fees and taxes imposed by the State, Municipal and/or other regulatory bodies.
- E. Pay all charges arising out of required inspections by the codes, permits, licenses or as otherwise may be required by an authorized body.

1.04 EXAMINATION OF DRAWINGS

- A. The drawings for the mechanical work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
- B. Contractor shall determine the exact locations of the equipment and rough-ins, and the exact routing of pipes and ducts so as to best fit the layout of the job.
- C. Scaling of the drawings will not be sufficient or accurate for determine these locations.
- D. Where job conditions require reasonable changes in indicated arrangements/locations, such changes shall be made by the Contractor at no additional cost to the Owner.
- E. Because of the scale of the drawings, certain basic items, such as fittings, boxes, valves, unions, etc., may not be shown, but where such items are required by other sections of the specifications or where they are required for proper installation of the work, such items shall be furnished and installed.
- F. The determination of quantities of material and equipment required shall be made by the Contractor from the drawings. Schedules on the drawings and in the specifications are completed as an aid to the Contractor, but where discrepancies arise, the greater number shall govern.

1.05 FIELD MEASUREMENTS

- A. Before ordering any materials or fabricating any supports, etc, the Contractor shall verify all pertinent dimensions at the job site and be responsible for their accuracy.

1.06 QUALITY ASSURANCE

- A. The Label or listing of the specified agency will be acceptable evidence that units conform to the requirements.

- B. Where equipment is specified to conform to the requirements of the ASME Boiler and Pressure Vessel Code for Design, fabrication and installation shall conform to the code in every respect.
- C. All equipment shall be installed in accordance with manufacturer's recommendations. Any proposed deviations shall be requested from the Engineer before installation.
- D. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those of the Base specification, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the performance from the system into which these items are placed. This includes changes found necessary during the testing, adjusting, and balancing phases of the project.

1.07 PRODUCT HANDLING

- A. Cover and protect all materials and equipment stored on-site from weather. Support above ground on temporary basis.
- B. Protect all mechanical products and control devices from damage, dust and construction debris. After installation is completed or while storing inside building, wrap and enclose all mechanical fixtures, equipment and control devices with canvas or heavy mill plastic, secured with wire or cord. Fixtures may be protected with the factory applied heavy paper or carton they are shipped in. Do not remove protection device until room or area is cleaned and free of dust and debris.

1.08 WORK COORDINATION

- A. Each Contractor shall coordinate his work with adjacent work and shall cooperate with all other trades so as to facilitate the general progress of the work. Each trade shall afford all other trades every reasonable opportunity for installation of their work and for the storage of their materials. In no case, will any Contractor be permitted to exclude from the premises or work place any other Contractor in the executing or installation of their work.
- B. Each trade shall perform its work in proper sequence in relation to that of other trades and as approved by the Engineer. Any cost caused by defective or ill-timed work shall be borne by the installation Contractor.
- C. Each Contractor shall arrange his work and dispose of material so as not to interfere with the work or storage of materials of others. Each Contractor shall join their work to that of others in accordance with the intent of the Project Drawings and Specifications.
- D. All trades shall work in cooperation with each other, and fit their work into the structure as job conditions may demand. All final decisions as to right-of-way and run of pipes and ducts, etc. shall be made by the Engineer or an authorized representative.
- E. It shall be the responsibility of the Contractor to keep constant check on the progress of the work so each particular trade can insure proper preparation for installation of that trade's work and not cause delay in the progress of the work. It shall further be the responsibility of the Contractor to periodically make inspection of work in progress and to notify the Engineer when work is complete in compliance with the Project Drawings and Specifications.

1.09 ACCESSIBILITY

- A. Provide access panels to valves, dampers, controls and equipment in walls or above inaccessible ceiling.

1.10 CLEAN-UP

- A. Remove all dust, plaster and construction debris from fixtures, equipment and control devices prior to painting or occupancy by Owner.
- B. Brush clean and apply one coat of rust-resistant paint to all new piping, pipe fittings and weld joints that have rusted during construction, prior to applying pipe insulation.
- C. All piping, pipe covering and ductwork shall be covered and protected from plaster, dust, paint droppings and other construction debris during construction.
- D. Paint all new equipment, which has rusted or had finish marred during construction to the satisfaction of Engineer. Replace if satisfactory restoration cannot be made.

1.11 OPERATING INSTRUCTIONS

- A. Deliver to the Owner, Maintenance and Operating Instruction, with replacement parts list, for all fixtures and equipment.
- B. Include a complete lubrication and maintenance schedule for all new equipment, with types of lubricants and frequencies recommended.
- C. Instruct and demonstrate to the Owner or his representative the operation and servicing (normal maintenance) of all equipment and systems provided. Use qualified manufacturer's representatives to explain heat or cold generation and temperature control equipment.

1.12 SYSTEM START-UP

- A. The mechanical systems included in the construction documents are to be complete and operating systems. The system start-up, testing, balancing, and satisfactory system performance is the responsibility of the Contractor. This shall include all calibration and adjustments of controls, noise level adjustments and final comfort factor adjustments that may be required.
- B. The Contractor shall adjust the mechanical systems and controls at season changes during the one-year warranty period, as required, to provide satisfactory operation and to prove performance of system used in all seasons.
- C. All operating conditions and control sequences shall be simulated and tested during the start-up period. Testing shall also include all interlocks, safety shutdowns, damper position controls, and alarms.

END OF SECTION

SECTION 23 11 26
FACILITY LIQUEFIED-PETROLEUM PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Propane gas piping system.
- B. Valves.
- C. Gas Regulator

1.02 SUBMITTALS

- A. Product Data: Provide data on valves and accessories. Provide manufacturer's catalog information. Indicate valve data and ratings.

1.03 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

1.04 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with all applicable local, state, and federal codes.
- B. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 - PRODUCTS

2.01 PROPANE GAS PIPING BELOW GRADE

- A. Polyethylene Pipe, Tubing, and Fittings: ASTM D 2513 and as recommended by the manufacturer for use with LP gas.
- B. Polyethylene pipe and fitting joints shall be by heat fusion or factory assembled transition fittings.

- C. Contractor shall provide suitable transition coupling at building steel to polyethylene connection.
- D. Contractor shall bury a tracer wire with the underground polyethylene pipe.
- E. Contractor shall provide a cap or closure for any abandon underground polyethylene pipe.

2.02 PROPANE GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53 or A120, Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234, forged steel welding type.
 - 2. Joints: NFPA 58, threaded or welded.

2.03 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2 inches and Under:
 - 1. Ferrous pipe: 150-psi malleable iron, ground joint, threaded unions.
- B. Pipe Size Over 2 inches:
 - 1. Ferrous pipe: 150 psi forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets.

2.04 PLUG VALVES

- A. Manufacturers:
 - 1. Powell
 - 2. Lunkenheimer
 - 3. Crane
- B. Up to and including 2 inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends.

2.05 GAS REGULATOR

- A. Contractor to install gas regulator inside the generator enclosure.
- B. Locate gas regulator as shown on drawings.
- C. Coordinate and maintain 5-foot separation from air intakes, building openings, and ignition sources per NFPA 58.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Provide piping connections to equipment with flanges or unions.
- D. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- E. Route piping in orderly manner and maintain gradient.
- F. Group piping whenever practical at common elevations.
- G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- H. Provide clearance for installation of insulation and access to valves and fittings.
- I. Exercise all necessary care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not erect or install any item that is not clean.
- J. Run pipelines straight and true, parallel to building lines with a minimum use of offsets and couplings. Provide only such offsets as may be required to provide necessary headroom or clearance and to provide necessary flexibility in pipelines.
- K. Changes in direction of pipelines shall be made only with fittings or pipe bends. Changes in size shall be made only with fittings. Miter fittings, face or flush bushings, or street elbows shall be used. All fittings shall be of the long radius type, unless otherwise shown on the drawings or specified. Welded elbows of angles that are not available as standard elbows to form smooth, long radius fittings.
- L. Arrange piping and piping connections so that equipment being served may be serviced or totally removed without disturbing piping beyond final connections and associated shut-off valves.
- M. All pipes shall be cut to exact measurement and installed without springing or forcing except in the case of expansion loops where cold springing is indicated on the drawings.
- N. Particular care shall be taken to avoid creating, even temporarily, undue loads, forces or strains on valves, equipment to building elements with piping connection or piping supports.
- O. Install valves with stems upright or horizontal.
- P. Provide a tracer wire for all underground nonmetallic piping

3.02 PROPANE GAS PIPING SYSTEMS

- A. System shall be approved by Iowa State Plumbing Code.
- B. Provide unions, at piping connections to all equipment, control valves, etc.
- C. Use dielectric unions for connecting dissimilar piping materials, copper, steel, or cast iron pipe, or fittings. Do not support metal piping with dissimilar/incompatible materials.

- D. Provide metal support affixed to building. Wood supports, acceptable on concrete pads, shall be of treated wood.
- E. Seal all openings around piping and pipe sleeves penetrating walls, floors and ceiling, including areas above suspended ceilings.
- F. Branch connections shall be made with standard tee or cross fittings of the type required for the service unless otherwise specified herein or detailed on the drawings.
- G. Threaded Joints:
 - 1. Ream pipe ends and remove all burrs and chips formed in cutting and threading.
 - 2. Protect plated pipe and valve bodies from wrench marks when making up joints.
 - 3. Apply Teflon tape thread lubricant to male threads.
- H. After installation, clean all metal pipes and fittings of rust and scale; then coat with Black paint.

3.03 PIPING SYSTEM TESTING

- A. Testing shall be conducted in the presence of the Owner's representative, the Engineer or their representative. Contractor shall notify the Engineer of proposed tests at least two days prior to testing.
- B. Respective piping Contractor shall provide all equipment required to conduct tests.
- C. Submit report of test results to the Owner and Engineer.
- D. Piping systems shall be tested as scheduled below, but not less the 50 percent above the operating pressure of the system.

System	Test	Test Pressure	Hold Period	Permissible Pressure Drop
Propane Gas	Pneumatic	3 psi inside 15 psi outside	2 hrs.	None

- E. All defects discovered during the tests shall be immediately corrected and piping system shall be retested until it qualifies. Defective joints found in welded piping shall be ground off and rewelded; screwed and soldered joints shall be disassembled, cleaned and rejoined as a new joint.
- F. Piping connected to specialties, or equipment with a lower pressure rating than specified test, shall be left unconnected or valve-off during test.
- G. After testing is completed on gas systems, fill system with gas and soap test all joints for leaks; or test with gas detection meter.

END OF SECTION

DIVISION 26

ELECTRICAL

SECTION 26 00 00
GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes all materials, equipment, and labor necessary for the installation of electrical systems.

1.02 CODES AND STANDARDS

- A. All materials supplied and all work performed shall comply with the latest revisions of applicable codes and standards of the following organizations:
 - 1. National Electric Code (NEC)
 - 2. National Fire Protection Association (NFPA)
 - 3. American National Standards Institute (ANSI)
 - 4. National Electric Manufacturers Association (NEMA)
 - 5. American Society for Testing and Materials (ASTM)
 - 6. Underwriters' Laboratories (UL)
 - 7. Institute of Electrical and Electronic Engineers (IEEE)
 - 8. Occupational Safety and Health Act (OSHA)
 - 9. All state and local codes as they apply.

1.03 GENERAL

- A. Contract Requirements
 - 1. Division 26 of the specifications covers the electrical systems of the project. It includes work performed by the electrical trades as well as trades not normally considered as electrical trades. These specifications are not intended to establish as a bill of material list for items required by the Contract, but are intended to establish material and performance standards
 - 2. Comply with all provisions of the Contract Documents including General Conditions, Supplementary General Conditions, and Division 1 of the specifications.
- B. SCOPE
 - 1. Provide all items and work indicated on the drawings and called for in the specifications. This includes all incidentals, equipment, appliances services, hoisting, scaffolding, supports, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide complete systems. Perform start-up and checkout on each item and system to provide fully operable systems.

2. It is the intent of the drawings and specifications to provide a complete workable system ready for the Owner's operation. Any item not specifically shown on the drawings or called for in the specifications, but normally required to conform with the intent, are to be considered a part of the Contract. Certain terms such as "shall, provide, install, complete, start up" are not used in some parts of these specifications. This does not indicate that the items shall be less than completely installed or that systems shall be less than complete.
3. Examine and compare the electrical drawings and specifications with the drawings and specifications of other trades, and report any discrepancies between then to the Engineer and obtain from him written instructions for changes necessary in the work. At time of bid the most stringent requirements must be included in said bid.
4. Install and coordinate the electrical work in cooperation with other trades installing inter-related work. Before installation, make proper provisions to avoid interferences in a manner approved by the Engineer.
5. The electrical work includes, but is not limited to the following:
 - a. Demolition of existing electrical connections, equipment and devices necessary to accomplish reconfiguration of feeders.
 - b. Temporary power and lighting system.
 - c. Reconfiguration of electrical service entrance, metering and grounding.
 - d. Replacement of distribution panelboard feeders as necessary to accomplish reconfiguration.
 - e. Installation of branch circuit wiring and devices (Conduit, boxes, conductors, etc.) for generator support requirements.
 - f. Rough in and connection to equipment as indicated on plans.
 - g. Coordination with local utility for service rework and switchover outage.
6. Work Not Included:
 - a. Vending equipment installation and connection.
 - b. Low voltage signal/communication equipment (telephone, computer, security, weather reporting system, etc.) installation or wiring.
 - c. Temperature control equipment and wiring.
 - d. Equipment painting (other than touch-up).
 - e. 15kV power service work shall be by local utility.

C. FEES

1. All local fees, permits and services of inspection authorities shall be obtained and paid for by the Contractor.
2. All bids shall include a \$5,000 allowance for each Circa 1965 building site (3 sites total) for utility service and transformer relocations.
3. All bids shall include a \$1,500 allowance for each Circa 2000 building site for utility activity.

D. DEFINITIONS

1. The following definitions are utilized within the drawings specifications:

- a. "PROVIDE" means to supply, purchase, transport, place, erect, and connect. Test and turn over to the Owner, complete and ready for regular operations, the particular work referred to.
- b. "INSTALL" means to join, unite, fasten, link, attach, set up or otherwise connect together before testing and turning over to the Owner, complete and ready for regular operation, the particular work referred to.
- c. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories and all other items customarily required to the proper and complete application for the particular work referred to.
- d. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such work.
- e. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
- f. "AS DIRECTED" means as directed by the Engineer, or his representative.
- g. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed within hung ceilings.

- 2. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.

E. CONTRACT DRAWINGS AND SYMBOLS

- 1. The electrical drawings listed in the Drawing Index, together with these specifications, are an integral part of the Electrical contract, what is called for in one is as binding as if called for in both. In case of conflict, the greater quantity shall prevail, subject to the approval of the Architect-Engineer.
- 2. The drawings are as accurate as planning can determine; however, field verification of all dimensions is directed. Specifications and drawings are for assistance and guidance, but exact locations, distances and levels shall be governed by field conditions.
- 3. The electrical drawings are diagrammatic only, but shall be followed as closely as actual construction of the building and work of other trades will permit. All changes from these drawings, necessary to adapt the work of other trades and to make the work of this Contractor conform to the building as constructed shall be made by the Electrical Contractor.
- 4. Field verify all measurements prior to installation. Electrical drawings shall not be scaled for the purpose of equipment installation, all measurements being derived from Architectural plans and shop drawings.
- 5. The graphic symbols in the "Electrical Symbols Schedule" list on the drawings have been used in part or in whole in the preparation of the electrical drawings accompanying these specifications.
- 6. Riser diagrams and key plans are shown only as a convenience to the Contractor and Electrician making the installation. In case of conflict between a Riser diagram and a floor plan, the greater quantity or better quality shall prevail and shall be subject to the approval of the Architect-Engineer.

7. The locations of lighting fixtures, outlets, panels and other equipment indicated on the drawings are approximately correct. Locations are understood to be subject to revision as may be found necessary or desirable at the time the work is installed in order to meet field conditions or to coordinate with modular requirements of ceilings. Any significant changes in location of outlets, cabinets, etc., necessary in order to meet field conditions shall be brought to the immediate attention of the Engineer and receive his approval before such alterations are made.
8. Exercise particular caution with reference to the location of panels, equipment, switches, etc. Have precise and defined locations approved by the Engineer before proceeding with the installation.
9. The drawings generally do not indicate the exact number of wires in each conduit for the branch circuit wiring of fixtures, and outlets, or the actual circuiting. Provide the correct wire size and quantity as required by the indicated circuiting and/or circuit numbers indicated and control, wiring diagrams, if any, specified voltage drop or maximum distance limitations, and the applicable requirements of the NEC. Derate in the manner discussed in specification Section 26 05 13 - Wires and Cables.
10. Adjust location of conduits, panels, equipment, pull boxes, fixtures, etc. to accommodate the work to prevent interferences, both anticipated and encountered. Determine the exact route and location of each raceway prior to fabrication.
11. Right-of-Way: Lines that pitch to have the right-of-way over those which do not pitch. For example: steam, condensate, and plumbing drains normally have the right-of-way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
12. Make offsets, transitions and changes in direction in raceways and as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the drawings.
13. Wherever the work is of sufficient complexity, prepare additional detail drawings to scale similar or larger than the bidding drawings, prepared on tracing medium of the same size as Contract drawings. Such detailed work to be clearly identified on the drawings as to the area to which it applies. With these layouts, coordinate the work with the work of other trades.

F. COORDINATION OF THE WORK

1. Coordinate and install the electrical work in cooperation with other trades. Before installation, make provisions to avoid interferences. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto, including equipment areas, chases and finished suspended ceilings.
2. The Contractor shall furnish services of an experienced Superintendent, who shall be in constant charge of all work, and who shall coordinate his work with the work of other trades. No work shall be installed before coordinating with other trades.

3. Coordinate, project and schedule work with other trades in accordance with the construction sequence. Transmit to other trades all information required for work to be provided under their respective sections in ample time for installation.
4. The Contractor shall order the progress of his work so as to conform to the progress of the work of other trades and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from the defective or ill-timed work performed under this section shall be borne by the Contractor.
5. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Applicable equipment and materials to be listed by Underwriters' Laboratories and manufactured in accordance with ASME, NEMA, ANSI or IEEE standards and as approved by local authorities having jurisdiction.
- B. All materials used shall bear the Underwriters' Laboratory, Inc. label provided a standard has been established for the material in question.
- C. Use only material manufacturers that are listed on the drawings or approved in the specification. If products and materials are not listed in either of the above, use first class products and materials.
- D. All materials and products furnished by the Contractor shall be new and unused (temporary lighting and power products are excluded) and free from defects, damage and corrosion.
- E. All equipment capacities, etc. are listed for job site operating conditions. All equipment sensitive to altitudes or ambient temperatures to be derated and method of derating shown on the shop drawings. Where operating conditions shown differ from the laboratory test conditions, the equipment to be derated and the method of derating shown on shop drawings.
- F. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material shall be the product of one manufacturer throughout. Multiple manufacturers of the same type of equipment will not be permitted.

2.02 SUBMITTAL

- A. Provide submittals to proposed products in the manner as discussed in the "Shop Drawing" discussion of the Supplemental General Conditions.
- B. Provide submittals for Engineer's review for the following products.
 1. Section 26 05 00
 - a. Conduit
 - b. Boxes

2. Section 26 05 13
 - a. 600-volt conductors
 3. Section 26 24 00
 - a. Panelboard breakers
 4. Section 26 28 16
 - a. Disconnect switches
 5. Section 26 45 00
 - a. Connectors (fittings/clamps)
 6. Section 26 36 00
 - a. Transfer switch
 7. Section 26 32 00
 - a. Package Generator
- C. Submittals shall include, but are not limited to, catalog cuts.

2.03 SUBSTITUTION

- A. Substitutions shall be considered at the time of submittal review
- B. Substituted material shall be equal in quality and performance as that material specified.
- C. The Engineer shall determine the quality and performance acceptability of any substitute submitted for review.
- D. The bid price submitted by the Contractor is assumed to include the use of specified material. There shall be no cost adjustment for the use of specified material.

PART 3 - EXECUTION

3.01 GENERAL

- A. Follow manufacturer's instructions for installing, connecting, and adjusting all equipment. Provide one copy of such instructions to the Engineer before installing any equipment. Provide a copy of the instructions at the equipment during any work on the equipment. Provide all special supports, connections, wiring accessories, etc.
- B. Use mechanics skilled in their trade for all work.
- C. Keep all items protected before and after installation.
- D. Before commencing work, examine all adjoining, underlying, etc., work on which this work is in any way dependent for perfect workmanship. Become thoroughly familiar with actual existing conditions to which connections must be made or which must be changed or altered. Report any condition which prevents performance of first class work.
- E. Perform all tests required by local authorities in addition to tests specified herein, such as life safety systems.

3.02 DEMOLITION AND CONTINUANCE OF EXISTING SERVICES

- A. Coordinate demolition with all trades and Owners. Existing building electrical shall be removed as required to achieve final result of One-Line diagram for site.
- B. Should any existing services, etc., interfere with new construction, the Electrical Contractor shall alter or reroute such existing equipment to facilitate new construction.
- C. Coordinate electrical outages with Owner's representative prior to any interruption in electrical service.

3.03 CLEANING UP

- A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean, subject to the Engineer's instructions, which shall be promptly carried out.
- B. Contractor shall clean all fixtures and equipment at the completion of the project.
- C. All panelboards, wireways, cabinets, enclosures, etc. shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. The Engineer as required shall open equipment for observation.

3.04 TESTING

- A. Complete testing of equipment and systems shall be provided in accordance with the Contract Documents.
- B. Notify the Engineer seven days prior to the test dates. If the Engineer so elect not to witness a specific test, a statement of certification must be forwarded to the Engineer for approval.

3.05 INSPECTIONS

- A. The Contractor shall see that local inspection authorities are notified when inspections are required by code.
- B. The Contract shall provide all necessary assistance to the Inspector when he is making an inspection.

3.06 RECORD OF CHANGES

- A. The Contractor shall maintain at the job site a complete set of electrical plans upon which he shall clearly mark and note in complete detail any changes made to the location and arrangement of electrical equipment, devices and wiring as a result of building construction conditions and change orders. Revisions shall be made daily when they occur.
- B. The Record Drawings shall record all changes from the original drawings and all pertinent information not shown on the original drawings to include:
 - 1. Addenda and change order revisions.
 - 2. Route and location of all underground and concealed feeders.

3. Interconnecting conduit between branch circuit items, junction boxes and panels. Actual route of conduit is not required, only how the various branch items are interconnected.
 4. Circuit numbers for all items where they do not agree with the plans. Circuit numbers on record drawings and panelboard directories must agree.
- C. The Contractor shall prepare "as-built" drawings as required by the Contract Documents. At a minimum, provide one set of construction drawings which clearly and legibly indicate the information required in Paragraph B. Above for record drawings. The "as-built" drawings will be marked "AS-BUILT Drawings" near the title block and dated on each drawing before being turned over to the Owner at the completion of the project.

3.07 PROJECT CLOSEOUT

- A. Provide project closeout documents in accordance with the Contract Documents. See Division 1 - Requirements.
- B. Provide two copies of maintenance and operation manuals consisting of all approved shop drawings and manufacturer's installation and operation instructions shipped with the equipment. Shop drawings and manufacturer's instructions shall be consolidated into a single 3-ring binder for electrical equipment.

END OF SECTION

SECTION 26 05 00
CONDUIT AND ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes furnishing and installing all conduits, fittings, and accessories as specified or indicated.

1.02 QUALITY ASSURANCE

- A. Applicable standards shall be latest revisions, supplements, and amendments to the following:

1. National Electrical Code (NEC).
2. Underwriters' Laboratories, Inc. (UL):
 - a. UL-6 - Rigid Metallic Electrical Conduit.
 - b. UL-467 - Electrical Grounding and Bonding Equipment.
3. American National Standards Institute, Inc. (ANSI):
 - a. C80.1 - Rigid Steel Conduit, Zinc Coated.
 - b. C80A - Fittings for Rigid Metal Conduit and EMT.
4. National Electrical Manufacturers Association (NEMA):
 - a. FB1 - Fittings and Supports for Conduit and Cable Assemblies.

- B. Acceptable Manufacturers:

1. Galvanized Rigid Steel Conduit and Electrical Metallic Tubing:
 - a. Allied Tube and Conduit Corporation.
 - b. Triangle PWC, Inc.
 - c. Republic Steel Corporation.
2. Conduit Fittings for Rigid Metallic Conduit:
 - a. Heavy Duty Fittings:
 - (1) Appleton Electric Company.
 - (2) Crouse-Hinds Company.
 - (3) O.Z. Gedney Company.
3. PVC conduit
 - a. Carbon "PVC Power and Communications Duct"
 - b. CertainTeed Corporation "PVC Utility Duct"
 - c. George-Ingram

PART 2 - PRODUCTS

2.01 DESIGN REQUIREMENTS

- A. UL Listed and labeled on each conduit length, fitting, and accessory.
- B. Sizes of conduit, fittings, and accessories as indicated, specified, or as required by applicable standards or codes.

2.02 RIGID STEEL CONDUIT & FITTINGS

- A. Mild ductile steel, circular in cross section with uniform wall thickness sufficiently accurate to cut clean threads.
- B. Each length threaded on both ends and threads protected by same process as used on each length. Threads cut after protective coatings are applied shall be retreated with the same zinc coating through a second hot-dip process.
- C. All scale, grease, dirt, burrs, and other foreign matter removed from inside and outside prior to application of coating materials.
- D. Galvanized by the hot-dip process as follows:
 - 1. Interior and exterior surfaces coated with a solid, unbroken layer of 99 percent virgin zinc by dipping.
 - 2. Coating not to show fixed deposits of copper after four 1-minute immersions in a standard copper sulfate solution.
 - 3. One coat of zinc chromate finish on inside and outside surfaces to prevent oxidation and white rust.
- E. Couplings, elbows and fittings shall be fabricated, coated and finished by the same process as conduit.
- F. All fittings and couplings are to be full-threaded type, split or setscrew types are not allowed.
- G. Uni-Swivel or Uni-Couple or other similar types of couplings will not be permitted.
- H. Minimum size shall be 3/4 inch nominal diameter.

2.03 ELECTRICAL METALLIC TUBING & FITTINGS

- A. Shall be UL listed.
- B. Shall be steel, zinc coated on the outside, and enamel coated on the inside surface.
- C. Connectors and fittings shall be of the compression type

2.04 PLASTIC/PVC CONDUIT

- A. Fabricated from self-extinguishing high-impact polyvinyl chloride.
- B. Fittings and accessories fabricated from same material as conduit.
- C. Solvent-cement type joints as recommended by manufacturer.
- D. Inside diameter no less than that of rigid steel conduit.
- E. Dielectric strength as minimum of 400 volts per mil.

- F. Rated and labeled for use with 90 degrees C rated conductors.
- G. Each length of conduit furnished with one belled end per length.
- H. To be Schedule 40 unless noted otherwise, or installed under vehicle drives or parking areas. Schedule 80, PVC conduit shall be used in these areas where Schedule 40 exceptions are required or noted.
- I. Flexible nonmetallic conduit (Smurf tube) shall be allowable when encased in concrete or in floor.

2.05 INGROUND HAND HOLES

- A. For reference in event of replacement of field construction damaged units.
- B. Boxes shall be non-corrosion composite material, green in color to blend into grass.
- C. Inside dimensions of hand hole shall be 12 inches by 12 inches with a 12-inch depth, no bottom. Provide extensions as required for a "clean installation".
- D. Shall have a bolt on matching cover.
- E. Shall be a Quazite Model No. PC1212BA12 with a No. PC1212CA00 cover with "Electric" logo on cover; or equal in concrete as 12-inch round with steel lid. Hand-holes for utility primary shall meet local utility requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install all exposed conduits in a neat manner and parallel to or at right angles to building lines and in accordance with the NEC.
- B. Install underground conduits at depths indicated on drawing or as required by the NEC. Shift elevation as required to clear existing underground utilities.
- C. Running threads will not be permitted.
- D. Coat all field cut threads, scars, or abrasions in galvanized conduit with an approved organic zinc rich primer equivalent to Koppers' "Organic Zinc".
- E. Coat all thread connections with anti-oxidizing compound approved by conduit manufacturer. Compound shall be suitable for steel-to-steel, steel-to-aluminum, and steel-to-PVC connections.
- F. Seal all conduit penetrations through concrete floors or walls with non-shrinking grout.
- G. Carefully ream ends of all conduit lengths after cutting to eliminate sharp burrs.
- H. Clean all conduits with swabs and mandrels after installation.
- I. Install a nylon or polypropylene pull rope in all communications conduits (above and below grade) and all spare underground ducts. Cap spare underground ducts for future use.

- J. Conduit fittings shall be installed as specified, indicated, or necessary.
- K. Conduit support system shall be constructed with sufficient rigidity to hold all conduits in permanent and neat alignment.
- L. Conduit support members, clamps, and hardware shall be galvanized steel.
- M. Conduit Types shall be used as follows:
 - 1. Underground or outside conduit, shall be PVC schedule 40 or 80, unless noted as being GRS conduit. Above grade shall be GRS or intermediate grade metal.
 - 2. Flexible nonmetallic shall be allowed when encased in concrete or in floor.
- N. Underground PVC conduits shall transition to galvanized rigid steel conduit before turning up to exit earth or concrete floor.
- O. Install hand holes with the top flush with grade. Install box on 8 inches of crushed compacted rock to support box and to provide drainage. Conduits shall turn up into hand hole with a 90-degree bend. Conduits shall have bushings on ends and protrude 2 inches above gravel. Seal conduit openings with mastic after wires are installed. Empty spare conduits shall be plugged to prevent debris from entering conduits.

END OF SECTION

SECTION 26 05 13
WIRES AND CABLES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes furnishing and installing 600-volt power, control cable, and instrumentation and communication cable.

1.02 QUALITY ASSURANCE

- A. Applicable standards shall be the latest revisions, supplements, and amendments to the following:
1. National Electrical Code (NEC)
 2. Underwriters' Laboratories, (UL) - 1072
 3. Institute of Electrical and Electronics Engineers (IEEE) - 383
 4. Insulated Cable Engineers Association (ICEA) - S48-516
 5. Association of Edison Illuminating Companies (AEIC) - CS6
 6. American Society for Testing and Materials (ASTM) - B8
- B. Acceptable Manufacturers:
1. Pulling Lubricant
 - a. American Polywater Corporation
 - b. Ideal Industries, Inc.
 2. 600 Volt Cable (120/240 volt power and lighting circuits)
 - a. Rome Cable Corporation
 - b. Triangle
 - c. Southwire

PART 2 - PRODUCTS

2.01 PULLING LUBRICANTS

- A. Pulling compound shall be listed by manufacturer as compatible with cable being pulled.
- B. Pulling compound shall contain no waxes, greases, silicones, or polyabkalene glycol oils or waxes.
- C. Pulling compound shall be rated for the air temperature in which the installation is being performed.
- D. Contractor shall follow the manufacturer's recommendation of application of pulling compound if used.

2.02 SINGLE-CONDUCTOR 600-VOLT WIRE

- A. Type THWN Wire (Interconnection Cable for Power, Lighting or Control)
 - 1. Material: Annealed uncoated copper in accordance with ASTM B3.
 - 2. Size: As indicated on the drawings.
 - 3. Description: Single-conductor stranded wire, 600-volt, and 75 degrees C temperature rating.
 - 4. Insulation: Heat- and moisture-resistant thermoplastic.
 - 5. Jacket: Smooth nylon, 4 mils thick (minimum).
 - 6. Identification: Mark surface of wire with manufacturer's identification, conductor size, and voltage rating.
 - 7. Minimum conductor size:
 - a. Power: #12 AWG
 - b. Control circuits: #14 AWG

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Cable shall be stored covered and elevated from ground on blocks to prevent contamination from mud, dirt, or water.
- B. Contractor shall swab and clean each conduit before installation of cable commences. Swab methods shall consist of wire brush and foam swab utilized together in proper size for conduit.
- C. Contractor shall use pulling lubricant as required or recommended by manufacturer to minimize strain on wires or cables.
- D. Ground Cable
 - 1. Reference Section 26 45 00 of this specification for installation of ground cable.
 - 2. Maintain color coding on grounding circuits as follows:
 - a. Green - Equipment grounding conductor.
- E. 600-Volt Cable
 - 1. Install where indicated on the drawings with size as indicated.
 - 2. Power circuit conductors shall be color coded as follows:
 - a. Black - Line 1 or Line 2
 - b. Green - Ground
 - c. White - Neutral
 - 3. 600-volt cable shall be derated for ambient temperature per NEC.

4. 600-volt cable shall be derated for fill by increasing the size to meet the NEC derating percentage stated for the number of current carrying conductors (including all neutral conductors) using the following nonderated schedule:
 - a. 20 amp #12 AWG
 - b. 30 amp #10 AWG
 - c. 50 amp #8 AWG

F. Controls and Instrumental Cable

1. Provide manufacturer's supplied or recommended cable.

END OF SECTION

SECTION 26 24 00
PANELBOARDS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes furnishing and installing all distribution panelboard, as shown on the drawings.

1.02 QUALITY ASSURANCE

- A. Applicable standards shall be the latest revisions, supplements, and amendments to the following:
 - 1. National Electrical Code (NEC).
 - 2. Underwriters' Laboratories (UL).
 - 3. National Electrical Manufacturers Association (NEMA).
 - 4. American National Standards Institute (ANSI).
- B. Acceptable Manufacturers (Determine by equipment at site)
 - 1. General Electric
 - 2. Square D
 - 3. Cutler-Hammer
 - 4. Engineer approved equal

PART 2 - PRODUCTS

2.01 PANELBOARDS

- A. Panelboards shall have main rating, main breaker, number of poles, and branch breakers as shown by the panelboard schedules on the drawings. Panels shall be UL labeled.
- B. 240/120-volt, single-phase, 3-wire panels shall have 100 percent rated neutral bus with a UL series connected rating of 22,000 AIC.
- C. Panelboards shall be equipped with bolt on breakers.
- D. GFI breakers shall be installed where panel schedule calls for ground fault breakers and as by specifications or as per manufacturer's recommended practice.
- E. Breakers shall not be of "Tandem" design.

- F. NEMA classification of panels shall be NEMA 1 unless noted otherwise on the drawings or specifications.

PART 3 - EXECUTION

3.01 GENERAL

- A. Breaker placement shall be as determined to fit panel(s).
- B. Contractor shall TYPE panel schedule on schedule card at the end of the job. Cards shall accurately and clearly reflect the circuits serviced by the breakers.
- C. Modify existing schedule neatly at project completion.

END OF SECTION

SECTION 26 32 00
PACKAGED ENGINE GENERATOR SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section includes:
 - 1. This section describes:
 - a. Packaged engine generator set.
 - b. Radiator.
 - c. Heat exchanger.
 - d. Exhaust silencer and fittings.
 - e. Fuel fittings.
 - f. Control panel.
 - g. Battery and charger.
 - h. Weatherproof enclosure.
- B. Related work specified elsewhere:
 - 1. Section 26 00 00 - Electrical General Provisions
 - 2. Section 26 36 00 - Enclosed Transfer Switch

1.02 REFERENCES

- A. NEMA AB3 - Molded Case Circuit Breakers.
- B. NEMA MG1 - Motors and Generators.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum.)
- D. NFPA 30 - Flammable and Combustible Liquids Code.
- E. NFPA 70 - National Electrical Code.
- F. NFPA 99 - Health Care Facilities.
- G. NFPA 101 - Life Safety Code.
- H. NFPA 110 - Emergency and Standby Power Systems.

1.03 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Shop Drawings: Indicate electrical characteristics and connection requirements. Show plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, and electrical diagrams, including schematic and interconnection diagrams.

- C. Product Data: Provide data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, day tank, and remote radiator.
- D. Test Reports: Indicate results of performance testing.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.04 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division 1.
- B. Operation Data: Include instructions for normal operation.
- C. Maintenance Data: Include instructions for routine maintenance requirements, service manuals for engine and day tank, oil sampling and analysis for engine wear, and emergency maintenance procedures.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with NFPA 110.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience, and with service facilities within 100 miles of Project.
- B. Supplier: Authorized distributor of specified manufacturer with minimum three years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 1.
- B. Accept unit on site on skids. Inspect for damage.
- C. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

1.08 MAINTENANCE SERVICE

- A. Furnish service and maintenance of engine generator for one year from date of Substantial Completion.

1.09 MAINTENANCE MATERIALS

- A. Furnish one set of tools required for preventative maintenance of the engine generator system. Package tools in adequately sized metal tool box.

1.10 EXTRA MATERIALS

- A. Provide two of each fuel, oil and air filter element for engine generator system.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Cummins/Onan
- B. Substitutions: Under provisions of Section 26 00 00. Caterpillar and Kohler are approved manufacturers.

2.02 PACKAGE ENGINE GENERATOR SYSTEM

- A. Description: NFPA 110, engine generator system to provide source of power for Level 2 applications.
- B. Standby System Capacity: Plan stated KW 120 degrees C rise at elevation of 3,000 feet above sea level, rating using engine-mounted radiator engine mounted heat exchanger.

2.03 ENGINE

- A. Type: Water-cooled inline or V-type, two stroke cycle, internal combustion engine.
- B. Rating: Sufficient to operate under 10 percent overload for one hour in an ambient of 90 degrees F at elevation of 3,000 feet.
- C. Fuel System: Propane fuel.
- D. Engine Speed: 1800 rpm.
- E. Governor: Isochronous type to maintain engine speed within 0.5 percent, steady state, and 5 percent, no load to full load, with recovery to steady state within 2 seconds following sudden load changes.
- F. Safety Devices: Engine shutdown on high water temperature, low oil pressure, overspeed, and engine overcrank. Limits as selected by manufacturer.
- G. Engine Starting: DC starting system with positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Include remote starting control circuit, with MANUAL-OFF-REMOTE selector switch on engine-generator control panel.
- H. Engine Jacket Heater: Thermal circulation type water heater with integral thermostatic control, sized to maintain engine jacket water at 90 degrees F, and suitable for operation on 120 volts AC.
- I. Radiator: Radiator using glycol coolant, with blower type fan, sized to maintain safe engine temperature in ambient temperature of 110 degrees F. Radiator air flow restriction 0.5 inches of water maximum.

- J. Engine Accessories: Fuel filter, lube oil filter, intake air filter, lube oil cooler, fuel transfer pump, fuel priming pump, gear-driven water pump. Include fuel pressure gauge, water temperature gauge, and lube oil pressure gauge on engine/generator control panel. Provide means of assuming low temperature starting of vapor propane fuel.
- K. Mounting: Provide unit with suitable spring-type vibration isolators and mount on structural steel base.

2.04 GENERATOR

- A. Generator: NEMA MG1, single-phase, 4-pole, reconnectable brushless synchronous generator with brushless exciter.
- B. Rating: At 0.8 power factor, 120/240 volts, 60 Hz at 1800 rpm.
- C. Insulation Class: F.
- D. Enclosure: NEMA MG1, open drip proof. Provide in manufacturer's standard color of approximate description of "Sand". Standard Green or Yellow are not acceptable.
- E. Voltage Regulation: Include generator-mounted volts per hertz exciter-regulator to match engine and generator characteristics, with voltage regulation plus or minus 1 percent from no load to full load. Include manual controls to adjust voltage droop, voltage level (plus or minus 5 percent) and voltage gain.

2.05 ACCESSORIES

- A. Residential type enclosure to limit sound emissions to 60dB at 300 feet.
- B. Exhaust Silencer: Residential type silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, sized in accordance with engine manufacturer's instructions.
- C. Fuel connection, fittings, and metering connection suitable for supplier.
- D. Batteries: Heavy duty, diesel starting type lead-acid storage batteries, 170 ampere-hours minimum capacity. Match battery voltage to starting system. Include necessary cables and clamps.
- E. Battery Tray: Treated for electrolyte resistance, constructed to contain spillage.
- F. Battery Charger: Current limiting type designed to float at 2.17 volts per cell and equalize at 2.33 volts per cell. Include overload protection, full wave rectifier, DC voltmeter and ammeter, and 120 volts AC fused input. Provide enclosure to meet NEMA 250, Type 1 requirements.
- G. Line Circuit Breaker: NEMA AB 3, molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole, sized in accordance with NFPA 70. Include battery-voltage operated shunt trip, connected to open circuit breaker on engine failure. Unit mount in enclosure to meet NEMA 250, Type 1 requirements.
- H. Engine-Generator Control Panel: NEMA 250, Type 1 mounted control panel enclosure with engine and generator controls and indicators. Include provision for padlock and the following equipment and features:

1. Frequency Meter: 45-65 Hz. range, 3.5 inch dial.
 2. AC Output Voltmeter: 3.5 inch dial, 2 percent accuracy, with phase selector switch.
 3. AC Output Ammeter: 3.5 inch dial, 2 percent accuracy, with phase selector switch.
 4. Output voltage adjustment.
 5. Push-to-test indicator lamps, one each for low oil pressure, high water temperature, overspeed, and overcrank.
 6. Engine start/stop selector switch.
 7. Engine running time meter.
 8. Oil pressure gauge.
 9. Water temperature gauge.
 10. Auxiliary Relay: 3PDT, operates when engine runs, with contact terminals prewired to terminal strip.
 11. Additional visual indicators and alarms as required by NFPA 110.
 12. Remote Alarm Contacts: Pre-wire SPDT contacts to terminal strip for remote alarm functions required by NFPA 110 and include a “proof of run” indication.
 13. Shall include Amp Sentry, single-phase, fault protection.
- I. Annunciator Panel: Surface mounted panel with brushed stainless steel. Provide audible and visible indicators and alarms required by NFPA 110.
1. High battery voltage (alarm).
 2. Low battery voltage (alarm).
 3. Low fuel (alarm).
 4. System ready.
 5. Anticipatory-high water temperature.
 6. Anticipatory-low oil pressure.
 7. Low coolant temperature.
 8. Switch in off position (alarm).
 9. Overcrank (alarm).
 10. Emergency stop (alarm).

11. High water temperature (alarm).
 12. Overspeed (alarm).
 13. Low oil pressure (alarm).
 14. Line power available.
 15. Generator power available.
 16. Lamp test and horn silence switch.
- J. Weather-Protective Enclosure: Reinforced steel housing allowing access to control panel and service points, with lockable doors and panels. Include fixed louvers, battery rack, and silencer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.02 FIELD QUALITY CONTROL

- A. Field testing will be performed by factory trained personnel in the present of an Owner's representative.
- B. Provide full load test utilizing portable test bank, if required, for four hours minimum. Simulate power failure including operation of transfer switch, automatic starting cycle, and automatic shutdown and return to normal.
- C. Record in 20-minute intervals during four hour test:
1. Kilowatts.
 2. Amperes.
 3. Voltage.
 4. Coolant temperature.
 5. Room temperature.
 6. Frequency.
 7. Oil pressure.
- D. Test alarm and shutdown circuits by simulating conditions.
- E. Provide Owner with Test Record.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems per manufacturer's recommended practice.

3.04 ADJUSTING

- A. Adjust work under provisions of Division 1.
- B. Adjust generator output voltage and engine speed.

3.05 CLEANING

- A. Clean work under provisions of Division 1.
- B. Clean engine and generator surfaces. Replace oil and fuel filters.

3.06 DEMONSTRATION

- A. Provide systems demonstration for Owner for demonstration of operation and for training.
- B. Describe loads connected to system and restrictions for future load additions.
- C. Simulate power outage by interrupting normal source, and demonstrate that system operates to provide power.

END OF SECTION

SECTION 26 36 00
ENCLOSED TRANSFER SWITCH

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Automatic transfer switch.

1.02 RELATED SECTIONS

- A. Section 26 00 00 - Electrical General Provisions.
- B. Section 26 32 00 - Package Engine-Generator System.

1.03 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. NEMA ICS 1 - General Standards for Industrial Control and Systems.
- C. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies.
- D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

1.04 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data: Provide catalog sheets showing voltage, switch size, ratings and size of switching and overcurrent protective devices, operating logic, short circuit ratings, dimensions, and enclosure details.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.05 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division 1.
- B. Operation Data: Include instructions for operating equipment. Include instructions for operating equipment under emergency conditions when engine generator is running.
- C. Maintenance Data: Include routine preventative maintenance and lubrication schedule. List special tools, maintenance materials, and replacement parts.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience, and with service facilities within 100 miles of project.
- B. Supplier: Authorized distributor of specified manufacturer with minimum three experiences.

1.07 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 1.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to internal components, enclosure and finish.

1.09 FIELD MEASUREMENTS

- A. Verify that field measurements are as instructed by manufacturer.

1.10 MAINTENANCE SERVICE

- A. Furnish service and maintenance of transfer switch for one year from date of Substantial Completion.

1.11 MAINTENANCE MATERIALS

- A. Provide maintenance materials under provisions of Division 1.
- B. Provide two of each special tool required for maintenance.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Onan
- B. Asco
- C. Kohler
- D. Engineer approved equal by Caterpillar

2.02 AUTOMATIC TRANSFER AND MANUALLY OPERATED SWITCH

- A. Description: NEMA ICS 2, automatic transfer switch with manual maintenance capability.

2.03 SERVICE CONDITIONS

- A. Service Conditions: NEMA ICS 1.
- B. Temperature: 90 degrees F.
- C. Altitude: 3,300 feet.

2.04 RATINGS

- A. Voltage: 240 volts, 1-phase, 3- wire, 60 Hz.
- B. Switched Poles: Two with open transition.
- C. Load Inrush Rating: Combination load.
- D. Continuous Rating: 600 amperes.

2.05 PRODUCT OPTIONS AND FEATURES

- A. Indicating Lights: Mount in cover of enclosure to indicate normal source available, alternate source available, and switch position.
- B. Test Switch: Mount in cover of enclosure to simulate failure of normal source.
- C. Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate to normal source.
- D. Transfer Switch Auxiliary Contacts: 1 normally open; 1 normally closed.
- E. Normal Source Monitor: Monitor normal source voltage and frequency; initiate transfer when voltage drops below 85 percent or frequency varies more than 3 Hertz from rated nominal value.
- F. Alternate Source Monitor: Monitor alternate source voltage and frequency; inhibit transfer when voltage is below 85 percent or frequency varies more than 3 Hertz from rated nominal value.
- G. Switched Neutral: Overlapping contacts.

2.06 AUTOMATIC SEQUENCE OF OPERATION

- A. Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor.
- B. Time Delay To Start Alternate Source Engine Generator: 0 to 5 seconds, adjustable.
- C. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.
- D. Time Delay Before Transfer to Alternate Power Source: 0 to 10 seconds, adjustable.
- E. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.
- F. Time Delay Before Transfer to Normal Power: 0 to 10 seconds, adjustable; bypass time delay in event of alternate source failure.
- G. Time Delay Before Engine Shut Down: 0 to 5 minutes, adjustable, of unloaded operation.
- H. Engine Exerciser: Start engine every 7 days; run for 30 minutes before shutting down. Bypass exerciser control if normal source fails during exercising period.

- I. Alternate System Exerciser: Transfer load to alternate source during engine exercising period.

2.07 ENCLOSURE

- A. Enclosure: NEMA, Type 3R.
- B. Finish: Manufacturer's standard Sand (preferred) or Gray enamel.

2.08 VENDOR SERVICE

- A. 100 Amp unit for vendor building or interior vendor panel may be a residential grade switch.
- B. The Circa 2000 building may have sufficient space within the building to mount this switch. Contractor is encouraged to work with Owner to facilitate this occurrence at the Cedar and Scott sites.
- C. If this switch is interior-mounted to the building, NEMA 1 enclosure is acceptable with a lockable front.
- D. Interior-mounted units shall be set to not transfer power to vendor panel during weekly test.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify conditions.
- B. Verify that surface is suitable for transfer switch installation.

3.02 INSTALLATION

- A. Install transfer switches in accordance with manufacturer's instructions.
- B. Provide engraved plastic nameplates with 1/4-inch lettering and attach with mechanical fastening and nameplate adhesive.
- C. Ensure that switch mounting is secure to building structure or floor.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems under provisions of Division 1.

3.04 DEMONSTRATION

- A. Provide systems demonstration under provisions of Division 1.
- B. Demonstrate operation of transfer switch in normal and emergency modes.

END OF SECTION

SECTION 26 45 00
GROUNDING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes furnishing and installing copper grounding cable for the equipment and structures.

1.02 QUALITY ASSURANCE

- A. Applicable standards shall be the latest revisions, supplements, and amendments to the following:
 - 1. National Electrical Code (NEC).
 - 2. American Society for Testing and Materials (ASTM) - B8.
 - 3. National Electrical Safety Code (NESC).
- B. Acceptable Manufacturers
 - 1. Ground Clamps and Bars
 - a. Burndy Corporation
 - b. Thomas & Betts Company
 - 2. Grounding Lugs and Grounding Splice Connectors
 - a. Burndy Corporation
 - b. Thomas & Betts Company
 - c. Anderson

PART 2 - PRODUCTS

2.01 GROUNDING SYSTEM

- A. Cable to equipment grounds shall be with compression type bolted lug connections. Lugs shall be copper, tin plated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Contractor shall ground all equipment as shown on the drawings. Ground shall be in conformance with the NEC.
- B. Contractor shall remove all paint, rust, or other non-conducting material from grounding contact surfaces before making connections.
- C. There shall be no splicing of grounding electrode cables unless it is shown on the drawings or approved by the Owner.

END OF SECTION

DIVISION 31

EARTHWORK

SECTION 31 11 00

CLEARING AND GRUBBING

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Remove shrubs within the construction area and/or as indicated.
- C. Related Sections and Work:
 - 1. Excavating, Stripping Topsoil, Filling, Grade: Division 31.

1.02 PROTECTION

- A. All remaining portions of property not scheduled for clearing and grubbing shall be completely protected during clearing and grubbing and removal of material. Any resulting damage shall be repaired or replaced to like new condition by the Contractor responsible.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide all barricades, fences, and warning lights as required to protect persons and property in accordance with all applicable Iowa DOT Specifications and regulations.

PART 3 EXECUTION

3.01 CLEARING/PROCEDURE

- A. In all activities, comply with pertinent regulations of governmental agencies having jurisdictions.
- B. Clearing and Grubbing:
 - 1. Protect all trees and other plant life which are subject to damage during construction.
 - 2. No burning on site permitted.
- C. Disposal of Materials:

1. All material shall become property of the Contractor and shall be removed from the Owner's site by the Contractor. No prolonged accumulation of debris will be allowed.
 - a. Remove all material from the site as removed. Storage of material on the site will not be allowed.
- D. Maintaining Traffic:
1. Ensure minimum interference with roads, driveways, sidewalks, and adjacent facilities.
 - a. Coordinate with Contractor staging requirements and areas defined on drawings.
 2. Do not close or obstruct roads, driveways, and sidewalks without permission from authorities having jurisdiction.
 3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

3.03 CLEAN UP/ACCEPTANCE

- A. Clean up trash and debris caused by clearing operations under this section, keeping premises, roads, and adjacent property clean and neat at all times.

END OF SECTION

SECTION 31 23 00

EXCAVATION AND FILL

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Excavation, backfill, and fill.
 - a. Compaction of materials relative to its placement.
 - 2. All excess material shall be removed from the site.
 - 3. Supply all additional material required to complete the earthwork as indicated on the drawings or herein specified.
 - 4. Provide field-testing, approvals, and reports as herein specified.
 - 5. Note: Ground water could possibly be encountered during excavation.
 - 6. This Contractor shall provide and maintain all erosion and sediment controls, silt fencing and bale check required by governing authorities.
 - a. Coordinate providing this work with all other excavation and earth moving sections of work.

1.02 RELATED SECTIONS

- A. Excavation, filling, compacting required in connection with utility work, and mechanical and electrical work: Divisions 23 and 26.

1.03 QUALITY ASSURANCE

- A. Required Testing:
 - 1. The Owner reserves the right to require and pay for field tests performed by an Iowa licensed professional Engineer. The engineering testing (geotechnical) firm, that shall make the following tests and/or special inspections for compliance with this section of work. The Contractor shall give the testing Engineer/firm a 24-hour notice prior to a required test(s).
 - 2. Excavation Testing:
 - a. Verify that the bottom of all excavations shall be undisturbed stable soils capable of providing the bearing capacity for the item it is supporting.
 - 3. Fill Testing:
 - a. Verify that the bottom of all backfill excavations is free of unstable soil before filling is commenced.
 - b. Perform density tests on all backfill.
 - c. Location of the test shall be as directed by the testing Engineer/firm.

4. The test results shall confirm the required density, compaction, and bearing specified. If the tests are below these requirements, the Contractor shall remove, refill, recompact, and test again at his/her own expense until the specified requirements are achieved.

1.04 PROTECTION

- A. Protect all utilities against damage.
- B. Provide all required barricades and post warning lights for safety of persons.
- C. Protect structures, utilities, and other facilities immediately adjacent to excavations from damage caused by settlement, lateral movement, undermining, washout and other hazards.
 1. Contractor is entirely responsible for strength and adequacy of bracing and shoring, and for safety and support of construction from damage or injury caused by the lack thereof or by movement or settlement.
- D. Comply with all applicable statutes, ordinances, codes and regulations regarding safety and health including local, state, federal and OSHA (Occupational Safety and Health Administration) jurisdictions.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Backfill: All material placed in excavations outside the structure limits is classified as "backfill."
 1. Clean earth free of organic materials.
 2. No solid material larger than 6" in its largest dimension shall be allowed.
 3. Excavated material, below topsoil, from the site is acceptable for backfill.
- B. Granular fill or fill: Material placed under construction is classified as "fill."
 1. Clean, granular fill, with no more than 5 percent of material passing a No. 200 sieve shall be placed immediately under the generator pad and adjacent PCC.
 2. The first 6" of fill immediately under sidewalks shall be clean granular fill.
- C. Topsoil: Topsoil is to be black, fertile and native to the area, free of stones, lumps, clods, plants, roots, sticks or other extraneous materials.
 1. Provide 6" minimum topsoil under all sodded, seeded, or planted areas.
- D. Barricades, fences, warning lights as required to protect persons and property, shall be in accordance with all applicable codes and regulations.

PART 3 EXECUTION

3.01 INSPECTION

A. Existing Utilities:

1. Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during excavation operations.
2. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Engineer immediately for directions as to procedure. Cooperate with the Owner, and public and private utility facilities in operation. Repair damaged utilities to the satisfaction of the utility owner.
3. Do not interrupt existing utilities serving facilities occupied and used by the owner or others, except when permitted in writing by the Engineer and then only after acceptable temporary utility services have been provided.

3.02 INSTALLATION/PROCEDURE

A. Stripping:

1. Strip all black dirt and topsoil to its entire depth, 6" minimum, from areas to be covered by exterior concrete and from areas to be cut or filled.
 - a. Areas to be stripped shall first be scraped clean of all brush, weeds, grass, roots and other materials. This material shall be removed off-site.
 - b. Stockpile the topsoil obtained on the site using care not to mix with subsoil. Pile in locations where it will not interfere with the building or construction operations.
 - c. This black dirt is to be spread as indicated under grading of this section.
 - d. Excess topsoil may be used for general fill for grading except not under any form of construction.

B. General Excavation:

1. Excavate for all subgrade work shown or specified to dimensions indicated, plus sufficient space to permit erection of forms and shoring.
 - a. Do all excavation of every description and of whatever substances encountered to dimensions and elevations indicated and/or specified herein, unless otherwise qualified herein.
2. Contractor shall be responsible to keep all excavations free of water during the entire process of work regardless of cause, source or nature of the water. Dewatering in order to complete this section of work shall be considered incidental to the earthwork.
3. Provide all shoring and bracing necessary to prevent cave-in of excavations or damage to structure. Remove shoring and piling before backfilling is completed, but not until permanent supports are in place.
4. Unauthorized Excavation: If materials are removed beyond indicated subgrade elevations or side dimensions, fill at no extra cost to the owner.
5. Removal of Unsatisfactory Soil Materials:

- a. Excavate unsatisfactory soil materials encountered that extend below the required elevations, to the additional depth directed by the Engineer or Geotechnical Engineer.
- b. Such additional excavation, provided it is not due to the fault or neglect of the Contractor, will be measured as directed by the Engineer and paid for as a change in the work.

C. Filling and Backfilling:

1. Place backfill and fill materials in layers not more than 8" in loose depth. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content of the soil material. Compact each layer to the required percentage of maximum density for each area classification.
2. Do not place backfill or fill material on surfaces that are muddy, frozen or contain frost or ice.
3. The finished compacted areas shall be brought to a reasonable true and even plane at the required elevations and shall be approved by the Engineer prior to further construction operations thereon.
4. Place backfill and fill materials evenly adjacent to structures, to the required elevations. Take care to prevent wedging action of the backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift. Provide bracing to maintain the structure true to required form.
5. Use power-drive hand tampers for compacting materials adjacent to structures.
6. All exterior concrete slabs on grade shall be placed on a bed of sub-base material as specified, compacted as specified, evenly graded and free from all rubbish and debris.

D. Compaction:

1. Control soil compaction during construction for compliance with the percentage of maximum density specified for each area classification.
2. Provide not less than the percentages of the maximum standard proctor density, ASTM D 698, of the same soil material compacted at optimum moisture content, for the actual density of each layer of soil material-in-place.
3. Where the subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply the required amount of water to the surface of subgrade, or layer of soil material in such a manner as to prevent free water appearing on the surface during or subsequent to compaction operations.
4. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified percentage of maximum density.
5. When the existing ground surface has a density less than that specified under "Compaction" for the particular area classification, break up the ground surface, pulverize, moisture condition to the optimum moisture content and compact to the required depth and percentage of maximum density.
6. Where completed areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, re-shape and compact to the required density prior to further construction. Use hand tamping for recompaction over underground utilities, if any.

7. Compaction over ditches less than 3 feet in width and around perimeter of walls and columns for distance of 3 feet from the wall or column shall be done by the use of mechanical hand compactors such as a Jackson Compactor.
- E. Grading:
1. Do all cutting, filling, compacting of fills and grading required to bring the entire project area, outside of buildings to subgrades as follows:
 - a. For surfaced areas (roadways, parking areas, curbs, service courts, steps and walks) to the underside of the respective surfacing, sub-base or base course, as fixed by the finished grades.
 - b. For lawn and planted areas, to 6" below finished grade. Fill and finish grade of such areas with topsoil to bring grade to elevations shown.
 - 1) Topsoil shall be prepared smooth, to final grade and loosened, ready to receive sod or seeding.
 - c. Slope uniformly to meet elevations at walks, drives, etc., and so as to prevent water pockets or irregular surface changes. The subgrade shall be sloped to provide drainage away from the building walls in all directions.
- F. Remove all waste materials, including excavated material classified as unsatisfactory soil material, trash and debris from the owner's property and legally dispose of it.
- G. Maintaining Traffic:
1. Ensure minimum interference with roads, sidewalks and adjacent facilities.
 2. Do not close or obstruct roads or passageways without permission from the Engineer.
 3. If required by the Engineer, provide alternate routes around closed or obstructed traffic ways.

3.03 CLEAN UP/ACCEPTANCE

- A. Protect newly graded areas from traffic and erosion, and keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded and rutted areas to the specified tolerances.
- C. Keep all travel routes free of tracked or spilled materials.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Trenching, backfilling, and compacting for all underground utility lines and services including but not limited to the following:
 - a. Gas lines.
 - 2. All excess material shall be removed from the site.
 - 3. Provide all additional material required to complete the work for this Section as indicated or required.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Backfill Materials: All material placed in trench excavations is classified as "backfill."
 - 1. Clean earth graded and free of organic materials.
 - 2. No solid material larger than 6" in its largest dimension shall be used.
 - 3. Excavated material, below topsoil, from the site is acceptable for backfill.
 - 4. Backfill beneath and within 5' of pavement areas shall be Special Backfill in accordance with Section 4132 of the Standard Specifications.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Utilities:
 - 1. Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the Contracting Authority.
 - 2. If active utility lines are encountered and are not shown on the Drawings, or otherwise made known to the Contractor, promptly take necessary steps to assure that the service is not interrupted.
 - 3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at not additional cost to the Contracting Authority.

4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure his instructions.
 5. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.
- B. Protection of Persons and Property:
1. Barricade open holes and depressions occurring as part of the work, and post warning lights on property adjacent to or with public access.
 2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
 3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.
- C. Dewatering:
1. Remove all water, including rainwater, encountered during trench and substructure work to an approved location by pumps, drains, and other approved methods.
 2. Keep trenches and site construction area free from water.
- D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- E. Maintain access to adjacent areas at all times:
- F. Trenching:
1. Contractor shall provide all necessary protection of the work and for the safety of personnel.
 - a. Prior to backfilling, remove all such protection materials.
 - b. Do not permit such protection materials to remain in the trenches, except when in the opinion of the Engineer, field conditions or the type of materials are such as to make removal of materials impractical. In such cases, the Engineer may permit portions of material to remain in the trench.
 2. Open Cut:
 - a. Excavate for utilities by open cut, except where installation by directional borings are noted otherwise on the Drawings.
 - b. If conditions at the site prevent such open cut and if approved by the Engineer, trenching may be used.
 - c. Short sections of a trench may be tunneled if, in the opinion of the Engineer, the conductor may be installed safely and backfill can be compacted properly into such tunnel.
 - d. Where it becomes necessary to excavate beyond the limits of normal excavation lines in order to remove boulders or other interfering objects, backfill the voids remaining after removal of the objects as directed by the Engineer.

- e. When the void is below the subgrade for the utility bedding, use suitable earth materials and compact to the relative density directed by the Engineer, but in no case to a relative density less than 90 percent.
- f. When the void is in the side of the utility trench or open cut, use suitable earth or sand compacted or consolidated, as approved by the Engineer, but in no case to a relative density less than 80 percent.
- g. Remove boulders and other interfering objects, and backfill voids left by such removal at no additional cost to the Contracting Authority.
- h. Excavating for Appurtenances:
 - 1) Excavate for manholes and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.
 - 2) Overdepth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel, or lean concrete as directed by the Engineer, and at no additional cost to the Contracting Authority.
- 3. Trench to the minimum width necessary for proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing for the utility.
- 4. Depressions:
 - a. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.
 - b. Except where rock is encountered, do not excavate below the depth indicated or specified.
 - c. Where rock is encountered, excavate rock to a minimum overdepth of 4" below the trench depth indicated or specified.
- 5. Where utility runs traverse public property or are subject to governmental or utility company jurisdiction, provide depth, bedding, cover, and other requirements as set forth by legally constituted authority having jurisdiction, but in no case less than the depth shown in the contract documents.
- 6. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace the turn upon completion of the backfilling.
- 7. Cover:
 - a. Provide minimum trench depth indicated below to maintain a minimum cover over the top of the installed item below the finish grade or subgrade.
 - 1) Areas subject to vehicular traffic:
 - a) As shown on the Drawings.
 - 2) Areas not subject to vehicular traffic:
 - a) As shown on the Drawings.
 - 3) All areas:
 - a) Gas Lines – as shown on the Drawings.

G. Backfilling:

- 1. General:
 - a. Except as otherwise specified or directed by special conditions, backfill trenches to the ground surface with selected material approved by the Engineer.

- b. Re-open trenches which have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified, or otherwise correct, to the approval of the Engineer.
- 2. Lower Portion of Trench:
 - a. Deposit approved backfill and bedding material in layers of 6" maximum thickness, and compact with suitable tampers to the density of the adjacent soil or grade, as specified herein, until there is a cover of not less than 12" over utility lines.
 - b. Take special care in backfilling and bedding operations to not damage pipe and pipe coatings.
- 3. Remainder of Trench:
 - a. Except for special materials for pavements, backfill the remainder of the trench with material free from stones larger than 6" or half the layered thickness, whichever is smaller, in any dimension.
 - b. Deposit backfill material in layers not exceeding the thickness specified, and compact each layer to the minimum density directed by the construction soil engineer.
- 4. Adjacent to Buildings: Mechanically compact backfill within 10' of buildings.
- 5. Under or Within 5' of Pavement: Backfill shall be granular material mechanically compacted.
- 6. Consolidation of backfill by jetting with water may be permitted, when specifically approved by the Engineer, in areas other than building and pavement areas.

3.02 FIELD QUALITY CONTROL

- A. The Engineer will inspect open cuts and trenches before installation of utilities, and will make the following tests:
 - 1. Assure the trenches are not backfilled until all tests have been completed.
 - 2. Check backfilling for proper layer thickness and compaction.
 - 3. Verify that test results conform to the specified requirements, and that sufficient tests are performed.
 - 4. Assure that defective work is removed and properly replaced.

3.03 CLEAN UP/ACCEPTANCE

- A. Protect newly graded areas from traffic and erosion, and keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded and rutted areas to the specified tolerances.
- C. Keep all travel routes free of tracked or spilled materials.

END OF SECTION

DIVISION 32

**EXTERIOR
IMPROVEMENTS**

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Division 00 – Procurement and Contracting Requirements and all provisions of Division 01 - General Requirements, apply to this Section.
- B. Section Includes:
 - 1. Fence fabric, posts and related items
 - 2. Excavation for fence posts
 - 3. Gates and related hardware

1.02 SUBMITTALS

- A. Product Data: Required. Include material descriptions, dimensions of individual components and profiles, and finishes for chain link fences and gates.
- B. Shop Drawings Required:
 - 1. Indicate plan layout, spacing of components, accessories, filaments, and anchorage.
 - 2. Submit manufacturer's installation instructions and procedures, including standard details of fence and gate installation.
- C. Samples: Required, see Item 2.02 MATERIALS for selection
 - 1. Fabric colors for selection or approval of Architect.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. A90/A90M, *Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc Alloy Coatings*
 - 2. A 370, *Mechanical Testing of Steel Products*
 - 3. A 392, *Zinc-Coated Steel Chain Link Fence Fabric*
 - 4. F 668, *Polyvinyl Chloride (PVC)-Coated Steel Chain Link Fence Fabric*
 - 5. F 934, *Standard Colors for Polymer Coated Chain Link Fence Materials*
 - 6. F 1043, *Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework*
 - 7. F 1664, *Standard Specification for Polyvinyl Chloride(PVC)-Coated Steel Tension Wire Used with Chain Link-Fence*

- B. Chain Link Fence Manufacturers Institute (CLFMI)

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable manufacturers, subject to compliance with Project requirements:
Master Halco, Inc., Richard's Fence, General Wire and Supply Co., or approved equal.

2.02 MATERIALS

- A. Polyvinyl Chloride (PVC)-Coated Steel Chain Link Fence System:
1. Height: As indicated on drawings.
 2. Fabric: 2" mesh, 9 ga. wire, with turn down knuckled and knubled
 3. Top Rail: 1-5/8" O.D. pipe
 4. Bottom Tension Wire: 7 ga.
 5. Line Posts: 2" O.D. pipe, Schedule 40
 6. End, Corner, Gate, and Pull Posts: 3" O.D. pipe, Schedule 40
 7. Finish:
 - a. Fabric: 2.0 oz. zinc coated as per ASTM A 392 or if noted on the drawings, 6 ga. bonded PVC coating in color as selected by the Architect, if not indicated on the drawings.
 - b. All other components: Finished to match fabric
 8. Gates: Frame 2" O.D. pipe welded at corners. Gate shall have a positive, automatic type latching device operative from both sides of gate with provision for padlocking.
 - a. Padlock: N.I.C.
 - b. Hinges sized to gate size and shall permit 180° swing.
 - c. Vehicle gates shall have automatic keepers which engage each gate leaf and holds it until manually released.
 9. Provide all accessories and hardware required for a complete installation.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Each post shall be anchored as indicated on drawings.
- B. Line posts shall be maximum 10 feet on center.
- C. Provide large gate swing posts as per standards for all gates over 7' - 0" in width.

- D. Top rails shall pass through intermediate post tops and form a continuous brace within each stretch of fence and be securely fastened to terminal posts.
 - 1. Pipe posts shall have tops that exclude moisture.
- E. End, corner, pull and gate posts shall be braced with the same material as the top rail and trussed to line posts with 3/8" rods and tighteners.
- F. Fabric shall be connected:
 - 1. To line posts every 14"
 - 2. To top rail every 24"
 - 3. To end, corner and gate posts by using tension bars connected to the post every 14" with steel bands with bolts and nuts
 - 4. To tension wire with hog rings every 24"

3.02 CLEAN UP/ACCEPTANCE

- A. Adjust gate and hardware to operate freely and properly.

END OF SECTION

SECTION 32 31 19

DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Division 00 – Procurement and Contracting Requirements and all provisions of Division 01 - General Requirements, apply to this Section.
- B. Section Includes:
 - 1. Metal fence pickets, rails, posts, and related accessories
 - 2. Finishing for metal fencing and gates
 - 3. Gates and related hardware

1.02 SUBMITTALS

- A. Product Data: Required. Include material descriptions, dimensions of individual components, and finishes for metal fence and gate(s).
- B. Shop Drawings Required:
 - 1. Indicate plan layout, spacing of components, accessories, and anchorage.
 - 2. Provide complete detailing of fabrication and installation including all anchorage and accessory items. Provide required templates for anchors and bolts specified for installation under other sections.
 - 3. Where metal fencing and gates are specified or required by code to comply with design loading, the shop drawings and structural calculations necessary shall be certified by a Licensed Professional Engineer.
- C. Finishing:
 - 1. Product Data: Manufacturer's data sheets on each paint and coating product, including the following:
 - a. Product characteristics
 - b. Surface preparation instructions and recommendations
 - c. Primer requirements and finish specification
 - d. Storage and handling requirements and recommendations
 - e. Application methods
 - f. Cautions, VOC's
 - 2. Color, if not indicated on the Drawings, will be selected by the Architect and submitted to the Contractor in scheduled form.

1.03 REFERENCES

- A. American Welding Society (AWS): *Structural Welding Code*
- B. ASTM International (ASTM):
 - 1. ASTM A36, *Standard Specification for Carbon Structural Steel*
 - 2. ASTM A47, *Standard Specification for Ferritic Malleable Iron Castings*
 - 3. ASTM A53, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*
 - 4. ASTM A123, *Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products*
 - 5. ASTM A153, *Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*
 - 6. ASTM A385, *Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)*
 - 7. ASTM A500, *Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes*
 - 8. ASTM A992, *Standard Specification for Structural Steel Shapes*

1.04 SYSTEM DESCRIPTION

- A. Structural Requirements: Design, engineer, fabricate and install metal fencing and gates to withstand acceptable standard, code required and/or prescribed structural loads without exceeding the allowable working stress of materials involved, anchors and connections. Apply each loading to each member to produce maximum stress in each fabrication component. Provide Certified Licensed Engineer (licensed by the State authorities where the project is located) Calculations and data, if requested.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide new metal, of the best commercial quality for the purpose intended, free from defects impairing strength, durability and appearance. Conform to the following standards for miscellaneous structural steel framing and miscellaneous non-structural steel:
 - 1. Structural Tube Columns: ASTM A500, Grade B
 - 2. Pipe: ASTM A53, Type S, Grade B
 - 3. Other Structural Steel: ASTM A36
 - 4. Malleable Iron Castings: ASTM A47
 - 5. Fasteners: Bolts, nuts, washers and other fasteners shall conform to the appropriate Federal Specifications.
- B. Gates: Gate shall have a positive, automatic type latching device operative from both sides of gate with provision for padlocking.
 - 1. Padlock: N.I.C.
 - 2. Hinges shall be gravity hinges sized to gate size and shall permit 180° swing.

- C. Miscellaneous Materials:
 - 1. Cold Galvanizing: Welco Cold Galvanizing, by Welco.
 - 2. Non-shrink Grout: Euco N-S Grout, by Euclid.
- D. Provide all accessories and hardware required for a complete installation.
- E. Finishing: Product names and numbers identified below reference Sherwin Williams (S-W) products. Other acceptable paint manufacturers, subject to compliance with the Project requirements, include: Pratt & Lambert, Benjamin Moore, Devco, PPG, Mautz, Hirshfield, or approved equal. Colors and finish as selected by Architect, if not indicated on the Drawings.
 - 1. Metal- Ferrous or Galvanized: High Gloss Latex Enamel
 - a. Touch up - S-W DTM Acrylic Primer/Finish
 - b. 2 Coats – S-W SuperPaint Exterior High Gloss Latex Enamel, A85 Series

PART 3 EXECUTION

3.01 INSTALLATION

- A. Space posts uniformly unless otherwise indicated.
- B. Posts shall be surface mounted as indicated on drawings.
- C. Check each post for vertical and top alignment, and maintain in position during placement and finishing operation.
- D. Install gates, if/where required, plumb, level, and secure for full opening without interference.

3.02 FINISHING

- A. Workmanship: Workmanship shall be of the very best. All materials evenly spread and smoothly flowed on, giving a uniform sheen and color without runs and sags. Transparent finishes shall have all coats brushed out smooth. Only skilled mechanics shall be employed and all materials shall be applied in strict accordance with manufacturer's directions. Except as otherwise specified, only one manufacturer's materials shall be used in each of the finishes specified
- B. Application:
 - 1. Apply all coatings and materials according to the manufacturer's printed recommendations.
 - 2. Do not apply to wet or damp surfaces.

3. Do no exterior painting below 50° F temperature.
4. Paint all exposed surfaces of every member. Paint anything inaccessible after installation before installation, if required to be painted.
 - a. Apply coatings using methods recommended by manufacturer.
 - b. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.
 - c. Apply coatings at spreading rate required to achieve the manufacturer's recommended dry film thickness.
5. Apply all coatings without reduction except as specifically required by label directions, or required by this specification. In such cases, reduction shall be the minimum permitted.
6. Thoroughly cover with uniform color and finish, as necessary for a complete hide, the number of coats specified being a minimum. Undercoats shall be colored to approximately match the final color.

3.03 CLEAN UP/ACCEPTANCE

- A. Clean up debris and unused material, and remove from site.
- B. Final Touch-up:
 1. Where coverage is incomplete or not uniform, as determined by the Architect, provide additional coats at no additional cost to the Owner.
 2. Touch-up damaged coatings after Substantial Completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

END OF SECTION

SECTION 32 31 29

WOOD FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Division 00 – Procurement and Contracting Requirements and all provisions of Division 01 - General Requirements, apply to this Section.
- B. Section Includes:
 - 1. Wood fence pickets, rails, posts and related accessories
 - 2. Excavation for fence posts
 - 3. Gates and related hardware
- C. Related Sections
 - 1. Section 03 30 00 – Cast-In-Place Concrete: Concrete fill for post holes

1.02 SUBMITTALS

- A. Product Data: Required. Include material descriptions and dimensions of individual components for wood fences.
- B. Shop Drawings Required:
 - 1. Indicate plan layout, spacing of components, accessories, and anchorage.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Western Red Cedar Fence System:
 - 1. Height: As indicated on drawings.
 - 2. Slats: Dog-eared slats, Shadow-box construction
 - 3. Top, bottom, and intermediate rails: 2x4 cedar
 - 4. Corner, gate, end, and/or line posts: 4x4 cedar
 - 5. Gates: Gate shall have a positive, automatic type latching device operative from both sides of gate with provision for padlocking.
 - a. Padlock: N.I.C.
 - b. Hinges sized to gate size and shall permit 180° swing.
 - 6. Provide all accessories and hardware required for a complete installation.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Space posts uniformly at 8'-0" o.c. unless otherwise indicated.
- B. Concrete set posts: Drill hole in firm, undisturbed or compacted soil. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post depth as indicated on drawings. Place concrete around post in a continuous pour. Trowel finish around posts and slope to direct water away from posts.
- C. Check each post for vertical and top alignment, and maintain in position during placement and finishing operation.
- D. Install gates, if/where required, plumb, level, and secure for full opening without interference.

3.02 CLEAN UP/ACCEPTANCE

- A. Clean up debris and unused material, and remove from site.

END OF SECTION

SECTION 32 90 00

PLANTING, TURF, AND GRASSES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of English Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Lawn - sodden and/or seeding:
 - a. Restore all lawns damaged as a result of completing the construction of this project, including at edges of paved areas.
 - 2. Plantings as per schedule on drawings.
 - a. Layout as per site plan.
 - 3. Bark mulch
 - 4. Rock Mulch
 - 5. Fabric liner
 - 6. Metal edging
 - 7. Excavation for trees and/or plants.
 - 8. Additional topsoil and placing of same for trees and/or plants.

1.02 WARRANTIES, GUARANTEES

- A. Guarantee: All plantings and seeding shall be guaranteed for one year (365 days) from acceptance of project by Owner. Replacement:
 - 1. Remove and replace any plant or seeding (as noted above) that is found dead or not in satisfactory growth.
 - 2. Replacement plants shall be same kind and size as specified for original plants.
 - 3. Cost of replacements shall be at expense of Contractor, except replacement required due to loss or damage due to occupancy of the project, vandalism or acts of neglect on the part of others during the guarantee period, after acceptance. Replacement plants shall be further guaranteed for another year from replacement.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil: Natural, friable, fertile, native peat loam possessing the characteristics of representative topsoil in the vicinity which produces heavy growths of vegetation.
 - 1. Topsoil shall be free from subsoil, noxious weeds, sticks, roots, stones, lime, concrete, ashes, slag or other deleterious matter, and shall be well drained in its original condition and free of toxic quantities of acid or alkaline elements.
 - 2. Contractor to add topsoil to areas receiving seeding as necessary.

- B. Sod: 1 ½" thick free from stones, dandelions, crab grass and weeds. Height of grass when sod is obtained shall not exceed 3". No peat grown sod permitted.
- C. Plant Material:
1. Names and Grades: Plant material shall conform to nomenclature of "Standardized Plant Names" as adopted by the Joint Committee of Horticulture Nomenclature, latest edition. Size and grading standards shall conform to the American Association of Nurserymen, Inc., as published in *American Standard for Nursery Stocks* latest edition. No substitutions of size or grade shall be permitted without written permission of the Engineer. Each bundle of plants and all separate plants, shall be properly identified with legible waterproof tag securely fastened to each plant or bundle of plants.
 2. Plant Schedule: See drawings. The height and caliper of the trees, the height or spread of shrubs, the diameter of the balls of roots are the minimum dimensions required. Plants indicated "B&B" are to be dug with a ball of earth and wrapped in burlap.
 3. Form: Well formed for the species or variety. Trees shall have single trunks, unless clump form is specified. Crotches shall be sound and unsplit.
 4. Digging and Handling: All precautions customary in good trade practice shall be taken in preparing plants for transplanting, in accordance with the *American Standard for Nursery Stock*, latest edition. Workmanship that fails to meet the highest standards will be rejected.
 5. Health: All plants including their roots shall be free from disease, insects or other injurious qualities. Contractor shall comply with all local, states, and federal laws pertaining to the inspection, sale, and shipment of plant materials. The trunk bark of all trees shall be sound. Trees shall have no large wound, and any small wound shall have a satisfactory callus roll formed or forming over them. Plants shall show good annual growth. Buds shall be plump and well filled for the species. Evergreen foliage shall be of good intense color. All plants shall be nursery grown except those trees and shrubs existing on the site that are transplantable. They shall have been growing in similar climatic conditions as the location of the project for at least two years prior to the date of this contract.
 6. Ball and Burlap: All balled and burlapped plants shall conform to the *American Standard for Nursery Stock* latest edition. All balls shall be of natural earth in which the plant has been growing. No manufactured or artificially produced or mudded-in balls shall be accepted. Balls shall be firm and unbroken and of large enough size to adequately enclose the plant's fibrous root system. Balled and burlapped plants may be rejected due to their failure to meet good digging practices.
- D. Water: Clean, free from deleterious substances.
- E. Grass Seed: Seed mix shall be for urban areas as specified in Article 2601.04, Paragraph C, of the Iowa DOT English Standard Specifications.

- F. Landscape Edging: All edging shall be 3/16" x 4" steel (Black) complete with anchor stakes.
- G. Bark Mulch: Commercially or locally processed cedar mulch, shavings, or ground bark free of growth or germination inhibiting ingredients. Mulch to be placed at a minimum of 4" depth.
- H. Rock Mulch: River rock shall be earth tones, minimum ¾" size. Place at a minimum depth of 3".
- I. Fabric Liner: Duon or equivalent landscape fabric.

PART 3 EXECUTION

3.01 INSTALLATION

- A. All planting shall be done in accordance with Section 2610 and articles of the Iowa DOT English Standard Specifications as stated below:
 - 1. Shrub Planting:
 - a. Layout: All shrubs shall be located as designated on the contract drawings and as directed by the Engineer. Where below ground or overhead obstructions are encountered, the shrubs shall be relocated as directed by Engineer.
 - b. Planting Pits: Shall be in accordance with Article 2610.03.
 - c. Setting of Shrubs: Shall be in accordance with Article 2610.03.
 - d. Pruning: Shall be in accordance with Article 2610.03.
 - e. Maintenance:
 - 1) The Contractor shall be required to make periodic checks on the total project to make certain that the materials are properly watered, cultivated, pruned and that all trees and evergreens are standing plumb, straightening those that are leaning, and that the sum of all conditions are contributing to the satisfactory progress of the materials, until such time as the work is approved by the Engineer and accepted by the Owner.
 - 2. Seeding:
 - a. Seed shall be applied to all disturbed areas not noted for sod, site improvements or landscaping.
 - b. Seeding shall be applied in accordance with Article 2601.04.
 - 3. Mulch Beds Over Liner:
 - a. Install edgings to locations shown on drawings to provide a uniformly level and in line edge.
 - b. All areas as shown on plans where seed or sod and mulch beds touch shall have steel edging installed.

- c. All planting beds or bufferstrips shall receive mulch over a liner unless indicated otherwise on plans. Place liner on subgrade at depth shown. Lap joints 2". If liner is non-perforated type, puncture at approximately 6" centers both directions, holes not to exceed 1/8" diameter.
 - d. Place mulch to uniform 4" depth for hardwood mulch and 3" for rock mulch if not otherwise indicated and flush with edging top.
- 4. Maintenance:
 - a. Commence immediately after each portion of lawn or planting is completed.
 - b. Maintain new plantings and water, mow and replant lawns to establish uniform turf until acceptance of project by Owner. Maintain watering for two weeks minimum regardless of project acceptance date.
 - c. Scattered bare spots in lawn no larger than 1 square foot each will be acceptable up to 3 percent of lawn area.
 - d. Repair any damage resulting from planting operations.

3.02 CLEAN-UP/ACCEPTANCE

- A. Protect/Clean
 - 1. Protect adjoining pavements, walks, structures from dirt and staining during completion of work. Cleaning of same is required.
 - 2. Leave site free of debris from this Section of Work.
 - 3. All ground areas disturbed as a result of planting operations shall be restored to their original condition or to the desired new appearance.
 - 4. Protect completed landscaping from any damage until project is accepted by Owner.

END OF SECTION

Introductory Information

**PROJECT MANUAL FOR:
CONTRACT 233AG
REST AREA STANDBY GENERATORS
STORY COUNTY REST AREA - NORTH BOUND
PROJECT NO. IMN-35-5(98)120--0E-85**

CERTIFICATION

PROJECT

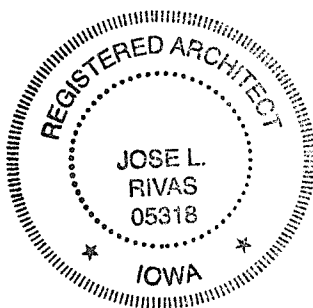
IDOT 233AG
Rest Area Standby Generators

ARCHITECT

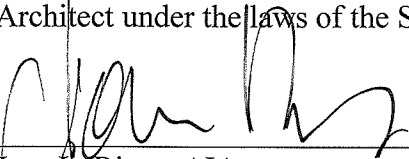
Yaggy Colby Associates
Mason City, Iowa and
717 Third Avenue SE
Rochester, MN 55904

Telephone: (507) 288-6464
Fax: (507) 288-5058

(SEAL)



I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly registered Architect under the laws of the State of Iowa.


Jose L. Rivas, AIA
License #05318

5/21/09
(Date)



My License renewal date is 06/30/11

Pages or sheets covered by this seal: Division 03.

LANDSCAPE ARCHITECT

Yaggy Colby Associates
215 North Adams
Mason City, IA 50401

Telephone: (641) 424-6344
Fax (641) 424-0351

<p>(SEAL)</p>  <p>A circular professional seal for Monte A. Appelgate, ASLA, License #342. The seal features the text "STATE OF IOWA" at the top, "MONTE A. APPELGATE" in the center, "LANDSCAPE ARCHITECT" below it, and "REGISTERED LANDSCAPE ARCHITECT" around the bottom edge. The number "342" is at the bottom center.</p>	<p>I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly registered Landscape Architect under the laws of the State of Iowa.</p> <p> <u>5/21/09</u> Monte A. Appelgate, ASLA (Date) License #342</p> <p>My License renewal date is 06/30/10</p> <p>Pages or sheets covered by this seal: Division 32.</p>
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CIVIL ENGINEER

French-Reneker-Associates, Inc.
1501 South Main Street
Fairfield, IA 52556

Telephone: (641) 472-5145
Fax: (641) 472-2653

(SEAL)



I hereby certify that this engineering document was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Iowa.

David H. Fredericks 5/21/09
David H. Fredericks, PE (Date)
License #9336


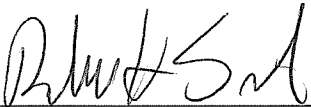
My License renewal date is 12/31/09

Pages or sheets covered by this seal: Divisions 02 and 31.

MECHANICAL/ELECTRICAL ENGINEER

Brown Engineering Company
5525 Meredith Drive, Suite D
Des Moines, IA 50310

Telephone: (515) 331-1325
Fax: (515) 331-1375

<p>(SEAL)</p> 	<p>I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.</p> <p> Robert H. Sieh, PE License #15377</p> <p>5-21-09 (Date)</p> <p>My license renewal date is 12/31/09</p> <p>Pages or sheets covered by this seal: Division 26.</p>
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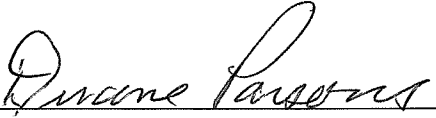
<p>(SEAL)</p> 	<p>I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.</p> <p> Duane P. Parson, PE License #10520</p> <p>5/21/09 (Date)</p> <p>My license renewal date is 12/31/09</p> <p>Pages or sheets covered by this seal: Division 23.</p>
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DIVISION 02

EXISTING CONDITIONS

SECTION 02 01 00

MAINTENANCE OF EXISTING CONDITIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Maintain operation of existing rest area facilities, sidewalks, and utility services.
 - 2. Contractor shall notify the Iowa DOT, Division of Maintenance Services, 24 hours (minimum) in advance of when he plans to be on-site and performing work.
- C. Related Sections of Work;
 - 1. Demolition: Section 02 41 00

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide all barricades, fences, and warning lights as required to protect persons and property in accordance with all applicable Iowa DOT specifications and regulations.

PART 3 EXECUTION

3.01 INSPECTION

- A. Locate existing utilities in areas of work before starting operations under this section. Use all means necessary to provide protection from damage during construction operations.
- B. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Engineer immediately for directions as to procedure. Cooperate with Owner and public and private utility companies in keeping services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

3.02 PROCEDURE

- A. Maintaining Traffic:
 - 1. Ensure minimum interference with roads, driveways, sidewalks, and adjacent facilities.

2. Do not close or obstruct roads, driveways, and sidewalks without permission from authorities having jurisdiction.
3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

B. Maintaining Utilities:

1. LP Gas Service and electrical service are essential to the operations of the rest area.
 - a. It will be necessary to shut down these services during construction. These shut downs shall be limited to two (2) hours per occurrence.
 - b. Contractor shall notify the Iowa DOT, Division of Maintenance Services, 48 hours (minimum) in advance of shutting down these services.

END OF SECTION

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Remove existing landscaping as indicated.
 - 2. Remove existing PCC sidewalk as indicated.
 - 3. Remove/abandon existing utilities as indicated.
- C. Related Sections and Work:
 - 1. Excavating, Stripping Topsoil, Filling, Grade: Division 31.
 - 2. Capping of Mechanical and Electrical Items: Divisions 23 and 26 – coordinate the proper local utility.

1.02 PROTECTION

- A. All remaining portions of property and utilities not scheduled for demolition shall be completely protected during demolition and removal of debris. Any resulting damage shall be repaired or replaced to like new condition by the Contractor responsible.

1.03 OCCUPANCY

- A. The rest area facilities shall remain open at all times.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide all barricades, fences, and warning lights as required to protect persons and property in accordance with all applicable Iowa DOT Specifications and regulations.

PART 3 EXECUTION

3.01 INSPECTION

- A. Prior to commencing the work installed under this section, examine the areas and conditions under which the work of this section will be performed. Notify the Engineer, in writing, of unacceptable conditions that exist, prior to acceptance.

3.02 CLEARING/PROCEDURE

- A. In all activities, comply with pertinent regulations of governmental agencies having jurisdictions.
- B. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- C. Demolition construction to be removed:
 - 1. Demolish completely and remove from the site.
 - 2. Use such methods as required to complete the work within the limitations of governing regulations.
 - 3. Break up and remove concrete slabs on grade as noted on drawings.
 - 4. Pollution Control:
 - a. Provide water sprinkling, temporary enclosures and other suitable methods as may be required to limit the amount of dust and dirt rising and scattering in the air to the lowest level of air pollution practical for the work conditions.
 - b. Comply with all governing regulations.
 - c. Clean adjacent structures and other improvements of all dust, dirt, and debris caused by demolition operations as directed by the Engineer.
 - d. Return all areas to conditions existing prior to start of the work of this section.
- D. Disposal of Materials:
 - 1. No demolition material is scheduled for reuse.
 - 2. All demolition material shall become property of the Contractor and shall be removed from the Owner's site by the Contractor. No prolonged accumulation of debris will be allowed.
 - a. Remove all demolition material from the site as removed. Storage or sale of removed items on the site will not be allowed.

3.03 CLEAN UP/ACCEPTANCE

- A. Clean up trash and debris caused by clearing operations under this section, keeping premises clean and neat at all times.

END OF SECTION

DIVISION 03

CONCRETE

SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Provide formwork for all cast-in-place concrete including formwork for concrete bases for equipment of mechanical and electrical divisions, if applicable. Contractors for Divisions 21, 22, 23, and 26 shall be responsible for size, location and required inserts.
 - 2. Install all inserts, sleeves, bolts and similar items required for the work of other sections.

1.02 RELATED SECTIONS AND WORK

- A. Furnishing of inserts, sleeves, bolts and similar items of other sections which are built into the work of this section.
- B. Exterior concrete pads for mechanical and electrical equipment: Respective Divisions 21, 22, 23, and 26.

1.03 QUALITY ASSURANCE

- A. American Concrete Institute (ACI)
 - 1. ACI 347, Recommended Practice for Concrete Formwork.
 - 2. ACI 301, Specifications for Structural Concrete for Buildings
 - a. Tolerances are not cumulative, 1/8" max.
 - 3. ACI 318 - Building Code requirements for Reinforced Concrete.
 - 4. PS 1 - Construction and Industrial Plywood.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Removable Forms:
 - 1. Forms for Exposed Finish Concrete: Unless otherwise shown or specified, construct formwork for concrete surfaces, which will be exposed to view in the completed project, with plastic coated plywood, metal, metal-framed plastic coated plywood or other acceptable panel-type materials, to provide continuous,

straight, smooth exposed surfaces. Furnish in largest practicable sizes to minimize number of joints.

- a. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
2. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed to view in the completed project with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
3. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces to be cured with water or curing compound.

B. Embedded Items, Accessories:

1. All anchor bolts, inserts, plates, angles, sleeves, nailing blocks, etc., whether furnished as specified under this division, or other divisions, furnished by other trades or by the Owner shall be installed by this Contractor. Anchor bolts, unless specifically furnished by others, will be furnished by this Contractor. Suitable templates will be constructed and used to accurately set and support against displacement all bolts, inserts, sleeves, etc.
2. Conduits and Pipes: This Contractor shall be responsible for controlling the proper placing of all embedded pipe, conduit and other fixtures. ACI 318, Article 6.3 shall apply to all cause of embedded fixtures.
3. Corner Formers: Provide 45 degrees corner formers (chamfer) on all exposed external corners and exposed edges in the final project.

C. Form Ties:

1. For unexposed concrete: Adjustable length removable or snap-off type which will leave holes no larger than 1" in diameter in face of concrete and when forms are removed no metal will be within 1" of finished concrete surface.
2. For exposed concrete:
 - a. Cone type, length and size required, with removable plastic cone, which when removed will leave clean, neat hole 1" dia. and approximately 1 1/2" deep.
3. No wire ties or site fabricated ties permitted.

PART 3 EXECUTION

3.01 INSTALLATION

A. Form Construction:

1. General: Construct forms complying with ACI 347, to the exact sizes, shapes, lines and dimensions shown and as required to obtain accurate alignment, location, grades, level and plumb work in the finished structures.
2. Design, engineering and proper construction of forms, shoring and bracing is the responsibility of the Contractor. Include all factors pertaining to safety of

formwork structure such as live load, dead load, weight of equipment on formwork, concrete mix, height of concrete drop, vibration reactions and similar factors.

3. Construct formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.
4. Construct formwork, brace, shore, tie forms to maintain position and shape true and straight without deflection.
5. Coat forms in accordance with manufacturer's recommendations to provide for removal of forms without damaging surface of finished concrete prior to placing reinforcement.
 - a. Do not coat construction joints.
 - b. Excess coating material shall not be allowed to stand in puddles in the forms nor allowed to come in contact with concrete against which fresh concrete will be placed.
 - c. Do not coat permanent forms.

B. Earth Forms:

1. Side forms for footings may be omitted and concrete may be placed directly against excavation, only when requested by the Contractor and approved in writing by the Engineer.
2. When omission of forms is accepted, provide additional concrete 1" on each side of the minimum design profiles and dimensions shown on the drawings.

C. Removal of Forms:

1. Remove forms in a manner and at such time to insure complete safety of the structure. In no case shall supporting forms or shoring be removed until sufficient strength has been obtained to support weight and load.
 - a. Results of job-cured cylinders (ASTM C 31) shall be used as evidence that concrete has obtained required strength.
2. Remove in manner that will not damage concrete or adversely affect appearance of exposed concrete members.
3. Coordinate removal with work of other trades.
4. Completely remove all wall ties, leaving clean cut holes without disfigurement of concrete.

D. Tolerances: Tolerances for construction of cast-in-place concrete work shall be as follows:

1. General: Tolerances of any kind permitted in construction shall not relieve the Contractor of providing the design indicated or fitting the different materials together properly for continuity of construction, proper function of building.
2. Footings:
 - a. Variation of dimensions in plan: +2", -1/2"
 - b. Variation of center from specified center in plan: 2 percent of footing width in direction of variation, plus or minus 2" maximum variation.
 - c. Variation of bearing surface from specified elevation: plus or minus 1/2".
3. Piers, Columns and Walls:

- a. Variation in cross-sectional dimensions of piers and columns and in thickness of walls: plus or minus 1/4".
- b. Variation in plan from specified location in plan: plus or minus 1/2" any member, any location.
- c. Deviation in plan from straight lines parallel to specified linear building lines.
 - 1) 1/40" per foot, adjacent members less than 20' apart or any wall length less than 20'.
 - 2) 1/2" adjacent members 20' or more apart or any wall length of 20'.
- d. Deviation from Plumb:
 - 1) 1/4" any 10' of height.
 - 2) 1" maximum for the entire height.
- e. Variation in elevation from specified elevation: plus or minus 1/2", any member, any location.
- f. Deviation in elevation from lines parallel to specified grade lines.
 - 1) 1/40" per foot, adjacent members less than 20' apart or any wall length less than 20'.
 - 2) 1/2" adjacent members 20' or more apart or any wall length of 20'.
- 4. Anchor Bolts and Sleeves:
 - a. Variation from specified location in plan: plus or minus 1/4".
 - b. Variation from specified elevation: plus or minus 1/2".
- 5. Deviation from Drainage (Pitch) Slope:
 - a. Tolerances of any kind permitted in construction shall not relieve the Contractor of providing uniform drainage pitch or slope (without areas that cause ponding) where indicated by note, elevation differences or design.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Fabrication and Placement of Reinforcement For:
 - a. Cast-In-Place Concrete
 - b. Structural Concrete
 - c. Including bars, welded wire fabric, ties, supports and accessories required.
 - 2. Furnishing bars for reinforced masonry.
 - 3. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site.
 - 4. Contractor is responsible for the fabrication processes, techniques of construction, coordination of his work with that of all other trades, and the satisfactory performance of his work.

1.02 QUALITY ASSURANCE

- A. American Concrete Institute (ACI)
 - 1. ACI 318, Building Code Requirements for Reinforced Concrete.
- B. Concrete Reinforcing Steel Institute (CRSI), American Society for Testing and Materials (ASTM), American Welding Society (AWS), American National Standards Institute (ANSI).
 - 1. Manual of Standard Practice
 - 2. ACI 301 - Structural Concrete for Buildings
 - 3. ACI SP-66 - American Concrete Institute - Detailing Manual
 - 4. ANSI/ASTM A 82 - Cold Drawn Steel Wire for Concrete Reinforcement
 - 5. ANSI/ASTM A 185 - Welded Steel Wire Fabric for Concrete Reinforcement
 - 6. ANSI/ASTM A 497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement
 - 7. ANSI/AWS D 1.4 - Structural Welding Code for Reinforcing Steel
 - 8. ASTM A 615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement
 - 9. ASTM A 706 - Low Alloy Steel Deformed Bars for Concrete Reinforcement
 - 10. AWS D 12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction
 - 11. CRSI - Placing Reinforcing Bars

1.03 SUBMITTALS

- A. Shop Drawings: If required by Engineer.
 - 1. Submit complete shop and setting drawings. Include reinforcing for all concrete and masonry work.
 - 2. Show reinforcing size, length, bending details, spacing, and methods of supporting reinforcing. Provide details as necessary to show final position of reinforcement in elements. Show all walls in plan and elevation.
 - 3. Engineer's review of shop drawings will be for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Compliance with the requirements for materials, dimensions, fabrication, and erection is the Contractor's responsibility.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver all bars to job site, bundled in manageable units and properly tagged to permit inspection identification.
- B. Do not exceed capacity of existing construction or formwork.
- C. Store reinforcing clear of ground and avoid contact with mud, grease, or other materials which would affect bond.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Reinforcing Steel:
 - 1. All Reinforcing Bars: ASTM A 615, Grade 60, deformed as per ASTM specifications.
 - 2. Welded Smooth Wire Fabric: ASTM A 185 welded steel wire fabric for concrete reinforcement, size as noted on drawings. Minimum 6" x 6": 1.4W x 1.4W Welded Wire Fabric.
 - 3. Dowels: Plain round rolled steel bars, ASTM A 306, Grade 80.
- B. Accessories:
 - 1. Chairs and spacers: Metal stock designed for purpose intended.
 - 2. Comply with CRSI "Recommended Practice for Placing Bar Supports, Specifications and Nomenclature".
 - 3. Provide galvanized or plastic tipped accessories in contact with forms for sight exposed concrete; stainless steel accessories for sandblasted or bush-hammered concrete.
 - 4. Wire: Plain, cold-drawn steel wire, ASTM A 82.

2.02 FABRICATION

- A. General: Fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI Manual of Standard Practice. In case of fabricating errors, do not rebend or straighten reinforcement in a manner that will injure or weaken the material.
- B. Unacceptable Materials: Reinforcement with any of the following defects will not be permitted in the work:
 - 1. Bar lengths, depths and bends exceeding specified fabrication tolerances.
 - 2. Bend or kinks not indicated on drawings or final shop drawings.
 - 3. Bars with reduced cross-section due to excessive rusting or other cause.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Comply with the specified codes and standards and Concrete Reinforcing Steel Institute recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified and noted on the structural drawings.
 - 1. Clean reinforcement to remove loose rust and mill scale, earth, ice and other materials which reduce or destroy bond with concrete. Metal reinforcement with rust, mill scale or a combination of both shall be considered as satisfactory, provided the minimum dimensions, including height or deformations and weight of hand wire brushed test specimen, are not less than the applicable ASTM specification requirement.
 - 2. Position, support and secure reinforcement against displacement by formwork, construction or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.
 - 3. All splicing of bars, concrete cover, placing tolerances and bar spacings shall conform to Building Code Requirements for Reinforced Concrete (ACI 318), as published by the American Concrete Institute and to recommended practices in Reinforcing Bar Splices by the Concrete Reinforcing Steel Institute. Splices not detailed require approval of the Engineer prior to placing concrete.
 - 4. Place reinforcement to obtain the minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports together with 16 gauge wire to hold reinforcements accurately in position during concrete placement operations. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.
 - a. Protect reinforcement by concrete as follows unless otherwise detailed:
 - (1) Where concrete is exposed to weather or to ground, but placed in forms: not less than 2" for bars more than 5/8" diameter and 1 1/2" for bars 5/8" or less in diameter.
 - 1) Concrete covering or reinforcing in footings: 3" clear on bottom and sides.

- (2) All other concrete: cover reinforcement a minimum of 3/4" for slabs and walls and 1 1/2" from floor penetrations and beam faces.
- 5. Coordinate and cooperate with other trades to insure that all reinforcing is in proper place and that all pipes, sleeves, conduit, anchors, bolts, flashings, caulking grooves, slips and other inserts of other trades to be cast into concrete are securely placed before concrete is placed.
- 6. Install welded wire fabric in as long lengths as practicable, cut to fit all penetrations. Lap wire mesh in structural slabs so that full, uncut squares of mesh of both sheets lap each other at least 1 1/2 times or 12", whichever is greater. Lap wire mesh in slabs on grade and topping slabs so that full, uncut squares of mesh of both sheets lap each other at least 1/2 times or 6", whichever is greater. Lap splices with 16 gauge wire or clip together with standard metal clips. Place mat flat, without roll or curling.
 - a. Unless otherwise indicated, reinforce all concrete floor slabs, precast plank topping, concrete decks on permanent forms, walks, drives and all exterior slabs on grade with 6" x 6": 1.4W x 1.4W welded wire fabric.
- 7. Provide sufficient numbers of supports and of strength to carry reinforcement. Do not place reinforcing bars more than 2" beyond the last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.
- 8. No bars shall be placed while concrete is being poured.
- 9. No bars shall be bent after being partially embedded in hardened concrete.
- 10. No welding of reinforcing steel shall be permitted without prior written authorization by the Engineer.
- 11. Provide concrete masonry walls with full height vertical reinforcing where noted on plans.
 - a. Provide the same vertical reinforcement at all door jambs, corners, control joints and each side of columns.

3.02 FIELD QUALITY CONTROL

- A. Notify Engineer when reinforcing is in place so that a review of reinforcement placement can be made prior to placement of concrete.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Provide all cast-in-place concrete including masonry fill, setting of fence posts, and like items.
 - 2. Install anchor bolt inserts and similar items furnished by other trades.
 - 3. Contractor for this section of work shall coordinate all phases of the concrete work to completion.

1.02 RELATED SECTIONS

- A. Section 03 10 00 – Concrete Forming and Accessories
- B. Section 03 20 00 – Concrete Reinforcing
- C. Furnishing of anchor bolts, inserts and similar items required by other trades.
- D. Exterior (exterior only), concrete bases for equipment of mechanical and electrical – Divisions 21, 22, 23, and 26.

1.03 QUALITY ASSURANCE

- A. Reference Standards for Design and Construction
 - 1. American Concrete Institute (ACI)
 - a. ACI 301, 84, Specifications for Structural Concrete for Buildings
 - b. ACI 304, Concrete Placement
 - c. ACI 305, Recommended Practice for Hot Weather Concreting
 - d. ACI 306, Recommended Practice for Cold Weather Concreting
 - e. ACI 318, Building Code Requirements for Reinforced Concrete
 - 2. American Society for Testing and Materials (ASTM)
 - a. ASTM C 31, Making and Curing Concrete Test Specimens in the Field
 - b. ASTM C 33, Standard Specification for Concrete Aggregates
 - c. ASTM C 94, Standard Specification for Ready-Mixed Concrete
 - d. ASTM C 143, Test Method for Slump of Portland Cement Concrete
 - e. ASTM C 150, Standard Specification for Portland Cement

- f. ASTM C 171, Standard Specification for Sheet Materials for Curing Concrete.
 - g. ASTM C 260, Standard Specification for Air-Entrained Admixtures for Concrete.
 - h. ASTM C 309, Standard Specification for Liquid Membrane-Forming Compound for Curing Concrete.
 - i. ASTM C 330, Standard Specification for Lightweight Aggregates for Structural Concrete
 - j. ASTM C 494, Standard Specification for Chemical Admixtures for Concrete.
 - k. ASTM C 979, Standard Specification for Pigments for Integrally Colored Concrete.
- B. Other portions of this Section 03 30 00 contain requirements and information related to ACI Standards and ASTM Standards; in case of conflict between these standards and this section, the requirements of this Section 03 30 00 shall govern.
- C. Testing:
 - 1. See Article 1106.02, Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation.
 - 2. The concrete furnished under this section of work shall be the strength as indicated in PART 3 - EXECUTION and the tests listed in PART 3 - FIELD QUALITY CONTROL are required. These tests will be provided by the Owner.

1.04 SUBMITTALS

- A. Comply with requirements of field quality control testing listed in PART 3 - EXECUTION.
- B. Concrete Mix Design:
 - 1. General Requirements: The Contractor, at his expense, shall employ the services of an independent testing laboratory to test the proposed aggregate and design concrete mixes for each type of concrete required.
 - a. Submittal and approval of mix design: Aggregate test reports and mix design shall be submitted to the Engineer and structural engineer in duplicate for approval at least 14 days prior to placing of concrete. No concrete will be allowed to be placed until the aggregate test reports have been reviewed and mix designs approved by the Engineer.
 - b. Testing of Aggregate: Each type of fine course aggregate to be used shall be completely tested in accordance with the requirements of ASTM C 33, latest edition, and these specifications. Lightweight aggregate shall be tested in accordance with the requirements of ASTM C 330, latest edition.
 - c. Use of reports from other projects: Reports of tests made for other projects may be submitted; however, such tests shall be representative of

1)	Gradation	ASTM C 136-71 and C 117-69
2)	Organic Impurities	ASTM C 40-73
3)	Friable Particles	ASTM C 142-71
4)	Coal and Lignite	ASTM C 123-69

- ## 1.05 WEATHER CONDITIONS

- ### Cast-In-Place Concrete

heating is provided. In no case shall concrete be exposed to freezing temperatures for 72 hours after placing.

3. Maintain concrete temperature not less than 50° F nor more than 90° F for the first three days after placing. Protect from freezing for the next five days.

H. Hot Weather Protection:

1. Perform all hot weather concreting in accord with ACI - 605 - "Recommended Practice for Hot Weather Concreting".
2. Thorough wet dry porous surfaces before concreting.
3. Maintain concrete temperature not less than 50° F no more than 90° F for the first three days after placing. Protect from temperatures over 90° F for the next five days.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All Concrete Materials shall be from Iowa Department of Transportation approved sources:
1. Portland Cement: ASTM C 150, Type 1
 2. Aggregate:
 - a. Applicable Standard: ASTM C 33
 - b. Aggregate shall be hard-coated gravel or crushed stone, maximum size 1/5 narrowest dimension between reinforcing rods. Sizes as follows:
 - 1) Footing: 1 1/2" maximum
 - 2) Fill for masonry: 3/8" maximum
 - 3) All other concrete: 3/4" maximum
 - c. Sand: ASTM C 33, clean, hard uncoated grain, free from loam, clay and silt.
 3. Water: Clean, potable and free of deleterious amounts of acids, alkalis and organic materials.

2.02 CONCRETE ADMIXTURES

- A. All Concrete Admixtures shall be Iowa Department of Transportation approved sources.
- B. Air Entraining Admixtures: Use in all concrete exposed to the weather and as specified for quality of concrete used, ASTM C 260.
1. "Aerolith", Sonneborn Building Products, Inc.
 2. "Sika-AEA", Sika Chemical Corp.
 3. "Darex AEA", W. R. Grace and Company
 4. Engineer approved equivalent

- C. Water Reducing Admixture: ASTM C 494, Type A, and not containing more chloride ions than municipal drinking water. Acceptable manufacturers:
 - 1. Euclid Chemical Company - Eucon WR-75
 - 2. Sika Chemical Corp. - Plastocrete 160
 - 3. Master Builders - Pozzoloth 200N
 - 4. Engineer approved equivalent
- D. Non-Chloride Accelerators: ASTM C 494, Type C or Type E, and not containing more chloride ions than municipal drinking water. Acceptable manufacturers:
 - 1. Sika Chemical Corp. - Sikacrete
 - 2. W. R. Grace - Darex Set Accelerator
 - 3. Master Builders - Pozzoloth 122-HE
 - 4. Engineer approved equivalent.
- E. Calcium chloride is prohibited
- F. Fly Ash: ASTM C 618 at Contractor's option

2.03 MISCELLANEOUS MATERIALS

- A. Liquid Curing and Sealing Compound: Acrylic base, ASTM C 309, Type I, containing a minimum of 18% solids.
 - 1. Performance Requirements:
 - a. Contains no wax, oils, salts or other ingredient that is detrimental to bonding concrete topping, sealants, resilient tile, paint or other specified finish being applied to concrete.
 - b. Contains no ingredient which stains or discolors concrete permanently.
 - 2. Acceptable Manufacturers:
 - a. Euclid Chemical Company - Rezseal
 - b. Sonneborn - Kur-N-Seal
 - c. Tamms Industries Co. - SC Seal Cure 18
 - d. Engineer approved equivalent
- B. Bonding Compound: Polyvinyl acetate, rewettable type.
 - 1. Acceptable manufacturers:
 - a. Euclid Chemical Company - Euco Weld
 - b. Tamms Industries Co. - Lab Liquid Adhesive Bond
 - c. L&M Construction Chemicals - Everweld
 - d. Engineer approved equivalent
- C. Expansion joint filler: Performed, resilient, non-extruding asphalt impregnated cane fiber conforming to ASTM D 1751, Exterior Use ASTM D 1752, Federal Specifications HH-F-341E, Type 1.

1. Size:
 - a. Use 1/4" thick x depth of slab for all interior slabs on grade (not exposed to the elements.)
 - b. Use 1/2" thick unless shown otherwise x depth of slab.
- D. Patching Concrete: Same materials and proportions as the concrete used except.
 1. Omit coarse aggregate.
 2. Use no more than one part cement to 2-1/2 parts sand by damp, loose volume.

2.04 FABRICATION

- A. Concrete Type and Strength: Concrete shall have a minimum compressive strength, in place, at 28-days as follows:
 1. Exterior concrete slabs on grade, footings, foundation walls, and retaining walls: 4,000 psi with entrained air.
 2. Masonry Fill/Grout: 2,000 psi
 3. Masonry Bond Beams: 3,000 psi
 4. All other Concrete: 3,000 psi
- B. Slump: Concrete slump be as determined by ASTM C 143 and shall be as follows:
 1. Slabs-on-Grade Foundation walls and retaining walls: 3" maximum.
 2. Footings: 3" to 4"
 3. Masonry fill/grout for reinforced cores and piers: 5" to 8"
- C. Water-Cement Ratio: All exterior concrete exposed to weather shall have a water-cement ratio of not more than 0.44. All other concrete shall have a maximum ratio of 0.53.
- D. High-Early Strength Concrete: Contractor may use Type III Portland Cement to produce high-early strength concrete. Adding additional amounts of Type I Portland Cement to product high-early strength concrete will not be permitted.
- E. Brand of Cement: Only one brand of Portland Cement shall be used. The same brand and type, normal or high-early strength, of Portland Cement shall be used for all concrete to have an architectural finish.
- F. Workability: Concrete consistency shall be such that concrete will fill forms without voids or honeycombs, completely embed and bond to reinforcing without permitting materials to separate, and not promote excess water to collect on surface.

G. Admixtures:

1. Entrained air: All exterior concrete exposed to weather shall be air-entrained. Proportions of entrained air, as determined by ASTM C 138, ASTM C 173 or ASTM C 231, shall be 5-7 percent by volume for concrete with 3/4" maximum nominal size coarse aggregate.
2. Water Reducing Admixture: Provide in all concrete.
3. Non-Corrosive Accelerator: Provide in concrete slabs placed when below 50° F.
4. Calcium Chloride: Not permitted
5. Fly Ash: ASTM C 618, Type C, Contractor's option per mix design. Not to exceed 15% by weight substitution for Portland Cement.

H. Concrete Mixing:

1. General: All concrete required shall be ready-mix concrete and shall be provided by an Iowa Department of Transportation approved ready-mix concrete facility.
2. Ready-Mixed Concrete:
 - a. Applicable Standard: Concrete shall be mixed and delivered in accordance with ASTM C 94.
 - b. Source: Source of ready-mix concrete shall be approved by Engineer.
 - c. Agitating: Agitate concrete materials continuously from time materials are placed in mixer until concrete is discharged.
 - d. Tempering: No additional water shall be added to mix after truck leaves batching plant without approval of Engineer.
 - e. Departure Certification: Each truck shall have time of departure from batching plant stamped on ticket.
 - f. Delivery Time: There shall be a maximum of 1-1/2 hours between time concrete mix is placed in truck and placing of concrete in forms. When air temperature is between 85° F and 90° F, maximum delivery time shall be 75 minutes. When air temperature is above 90° F, maximum delivery time shall be 60 minutes.

PART 3 EXECUTION

3.01 INSTALLATION

A. Preparation before Placing Concrete:

1. General: Before concrete placement, formwork shall be completed, elevations verified, slope or drainage verified, snow, ice and water and other debris shall be removed, reinforcement shall be secured in place, and expansion joint materials shall be positioned.
 - a. Preparation of Subgrades: Sprinkle semi-porous subgrades sufficiently to eliminate suction. Do not place concrete on frozen ground, on soft mud, or dry porous earth.

2. Cleaning Equipment: Remove hardened concrete and foreign materials from inner surface of conveying equipment.
3. Verify completion of all other work to be covered or enclosed by the concrete.

B. General:

1. Conveying Concrete: Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.
2. In joining fresh concrete to concrete that has already set, remove all loose and foreign materials from set concrete. Scrub with wire brooms and thoroughly clean. Moisturize when the new concrete is placed.
3. Exercise care in placement of concrete for slabs on grade over vapor barrier. Avoid puncturing or tearing vapor barrier during transportation and placement.

C. Placing Concrete:

1. Placing Exterior Slabs and Sidewalks:
 - a. Shelter Slabs Subgrade: Place shelter slabs on a minimum 12" thick compacted granular fill.
 - b. Thickness and reinforcing as shown on drawings.
 - 1) Minimum concrete (slab) thickness 6".
 - 2) Minimum reinforcing as indicated on Drawings.
 - c. Finish: Broomed finish unless otherwise indicated. After floating, troweling and when water sheen has disappeared, brush lightly with approved steel or fiber broom, to a uniform roughened surface. Brooming shall be at right angle to the centerline of walks and always in one direction of large continuous areas.
 - d. Expansion Joints: 1/2" pre-molded bituminous filler in locations detailed and at intervals not exceeding 30' in any direction.
 - e. Slope: Slope all exterior concrete slabs in a manner to prevent the collection of water.
 - f. Construction of Portland Cement Concrete sidewalks shall conform to Section 2511 of the Iowa DOT Standard Specifications.
 - g. Concrete shall be Class C concrete produced and placed in accordance with Section 2301 and Article 4115.04, Paragraph C, Iowa DOT Standard Specifications.
 - h. Course aggregate shall be Class 3i Durability.

- D. Consolidated Concrete:
1. General: Consolidate concrete by vibrating, spading, rodding or forking so that concrete is thoroughly worked around reinforcement, around embedded items, and into corners of forms to eliminate air or stone pockets which may cause honeycombing, pitting or planes of weakness. Use competent workmen under competent supervisors.
- E. Joints in Concrete:
1. Locate construction joints as indicated on drawings, or as approved by the Engineer.
 - a. Place joints perpendicular to the main reinforcement.
 - b. Refer to drawings for control and construction joints
 2. Expansion Joints: Refer to drawings and/or install whenever slabs abut vertical surfaces ACI 301.
 3. Contraction Joints: Refer to drawings for details and spacing notes.
- F. Pipe Sleeves and Embedded Items:
1. Before pouring any concrete, determine that all embedded metal pipe sleeves, anchors, anchor slots, anchor bolts, hangers, concrete inserts, and similar items are firmly secured and fastened in place and that all embedded items required of other divisions have been furnished and installed.
- G. Repairing and Patching: Remove and replace at no additional cost any concrete not formed as shown on plans, concrete out of alignment, surfaces beyond required tolerances or defective surfaces which cannot be properly repaired or patched, including any concrete failing to meet the strength requirements as determined by the testing laboratory.

3.02 CURING

- A. Protect concrete from premature drying. Provide temporary housing, covering, or other protection used in curing and keep in place and intact a minimum of 24 hours after artificial heating or cooling has been discontinued. Follow finishing operations with curing measures within two hours.
- B. Keep concrete continuously moist for 7 days. Prevent rapid drying at the end of the curing period. Accomplish cure by one of the following methods:
1. Ponding or continuous sprinkling.
 2. Absorptive mats or fabrics kept continuously wet.
 3. Non-staining waterproof paper as specified. Keep all joints airtight and weighted in place.
 4. Non-staining polyethylene film as specified. Keep all joints weighted to prevent wind penetration.

3.03 FIELD QUALITY CONTROL

- A. Comply with pertinent provisions of Article 1106.02, Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation.
- B. Work installed under this section shall be performed under the supervision of a capable foreman, in conformance with the standards referenced above.
- C. Testing: Owner will hire a Testing Agency to perform the following tests:
 - 1. Slump Tests:
 - a. Test Procedure: Maintain a slump cone on job during all concreting operations. Conduct slump tests in accordance with ASTM C 143.
 - 2. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one test for each set of compression test specimens.
 - 3. Compression Tests of Concrete Cylinders:
 - a. Cost Responsibility for Tests: Owner will have concrete test cylinders tested by a testing laboratory supervised by a professional Engineer licensed in the state of Iowa, and shall pay all costs of taking samples and performing the tests. Test cylinders shall be made in accordance with the "Standard Method of Making and Curing Concrete Compression and Flexure Test Specimens in The field" (ASTM C 31.) for compliance with specified strength.
 - b. Frequency of Testing: Take two sets of three test cylinders for every concrete placement and not less than two sets of three test cylinders for each additional 50 cubic yards of concrete placed. The first set of cylinders shall be considered control cylinders and shall be laboratory cured at 70° F. Of the control set, one cylinder shall be tested at 7 days, one at 28 days, and the third cylinder shall be tested only if 28-day cylinder failed. The second set of cylinders shall be job cured and used to determine when forms and shoring may be removed. The first of these cylinders shall be tested at 7 days and the other two cylinders tested only if required.
 - c. Number of Tests Per Set: Each set of test cylinder shall consist of three concrete test cylinders, 6" x 12" and each set shall be considered as one test. All cylinders in each set shall be taken from the same batch of concrete. Contractor shall note date, location and concrete slump on each cylinder made.
 - d. Location of Making Cylinders: Concrete test cylinders shall be made at discharge end of chute, slide or pipe and not at truck or mixer.
 - e. Strength Requirements: The strength level of the concrete will be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength f'c and no individual strength test result falls below the specified strength f'c by more than 500 psi.

- f. Compression Test Failure: Failure of concrete compression tests to meet specified strength will require a load test or test cores at Contractor's expense. Failure to meet required live and dead loads or meet strength requirements of cores shall constitute rejection or consideration for rejection by the ENGINEER. Cost of measures to make work satisfactory shall be paid by Contractor.
- 4. Reports:
 - a. Submit test result reports to Engineer.

END OF SECTION

DIVISION 23

HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

SECTION 23 00 00
HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Furnish all labor, materials, tools, equipment, scaffolding, transportation, permits, inspection certificates and temporary protection necessary to complete installation of all work as shown on Project Drawings and/or called for in these specifications. Drawings and specifications shall be considered mutually coordinate, and any material included in one but not the other shall be furnished as though required in both. All material necessary to provide a complete working installation shall be furnished whether mentioned or not.
- B. Before turning equipment over to the Owner, the Contractor shall thoroughly test equipment and instruct the Owner or his representative in its operations and maintenance.

1.02 CODES AND STANDARDS

- A. Comply with the latest applicable codes and standards as set forth by the following:

AGA	American Gas Association
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute, Inc.
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
DNR	Department of Natural Resources, State of Iowa
EPA	U.S. Environmental Protection Agency
MCA	Mechanical Contractors Association
MSS	Manufactures Standardization Society
NADCA	National Air Duct Cleaners Association
NBS	National Bureau of Standards
OSHA	Occupational Safety and Health Act
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
	State and Local Codes and Ordinances

- B. If there is a discrepancy between the codes and regulations having jurisdiction over this installation and these specifications, the Engineer shall determine the method or equipment used.
- C. If the Contractor notes, at the time of bidding, any parts of the drawings and specifications which are not in accordance with applicable codes or regulations, he shall inform the Engineer in writing, requesting a clarification. If there is insufficient time to follow this procedure, he shall submit with his proposal a separate price required to make the system shown on the drawings comply with the codes and regulations.
- D. All changes to the system made after the letting of the contract, in order to comply with the applicable codes or the requirements of the Inspector, shall be made by the Contractor without cost to the Owner.

- E. If there is a discrepancy between the manufacturer's recommendations and these specifications, the manufacturer's recommendations shall determine the method or equipment used.

1.03 PERMITS, FEES, TAXES, INSPECTIONS

- A. Procure all applicable permits and licenses.
- B. Abide by all applicable laws, regulations, ordinances, and other rules of the State or Political Subdivision wherein the work is done, or as required by any duly constituted public authority.
- C. Pay all applicable charges for such permits or licenses that may be required.
- D. Pay all applicable fees and taxes imposed by the State, Municipal and/or other regulatory bodies.
- E. Pay all charges arising out of required inspections by the codes, permits, licenses or as otherwise may be required by an authorized body.

1.04 EXAMINATION OF DRAWINGS

- A. The drawings for the mechanical work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
- B. Contractor shall determine the exact locations of the equipment and rough-ins, and the exact routing of pipes and ducts so as to best fit the layout of the job.
- C. Scaling of the drawings will not be sufficient or accurate for determine these locations.
- D. Where job conditions require reasonable changes in indicated arrangements/locations, such changes shall be made by the Contractor at no additional cost to the Owner.
- E. Because of the scale of the drawings, certain basic items, such as fittings, boxes, valves, unions, etc., may not be shown, but where such items are required by other sections of the specifications or where they are required for proper installation of the work, such items shall be furnished and installed.
- F. The determination of quantities of material and equipment required shall be made by the Contractor from the drawings. Schedules on the drawings and in the specifications are completed as an aid to the Contractor, but where discrepancies arise, the greater number shall govern.

1.05 FIELD MEASUREMENTS

- A. Before ordering any materials or fabricating any supports, etc, the Contractor shall verify all pertinent dimensions at the job site and be responsible for their accuracy.

1.06 QUALITY ASSURANCE

- A. The Label or listing of the specified agency will be acceptable evidence that units conform to the requirements.

- B. Where equipment is specified to conform to the requirements of the ASME Boiler and Pressure Vessel Code for Design, fabrication and installation shall conform to the code in every respect.
- C. All equipment shall be installed in accordance with manufacturer's recommendations. Any proposed deviations shall be requested from the Engineer before installation.
- D. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those of the Base specification, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the performance from the system into which these items are placed. This includes changes found necessary during the testing, adjusting, and balancing phases of the project.

1.07 PRODUCT HANDLING

- A. Cover and protect all materials and equipment stored on-site from weather. Support above ground on temporary basis.
- B. Protect all mechanical products and control devices from damage, dust and construction debris. After installation is completed or while storing inside building, wrap and enclose all mechanical fixtures, equipment and control devices with canvas or heavy mill plastic, secured with wire or cord. Fixtures may be protected with the factory applied heavy paper or carton they are shipped in. Do not remove protection device until room or area is cleaned and free of dust and debris.

1.08 WORK COORDINATION

- A. Each Contractor shall coordinate his work with adjacent work and shall cooperate with all other trades so as to facilitate the general progress of the work. Each trade shall afford all other trades every reasonable opportunity for installation of their work and for the storage of their materials. In no case, will any Contractor be permitted to exclude from the premises or work place any other Contractor in the executing or installation of their work.
- B. Each trade shall perform its work in proper sequence in relation to that of other trades and as approved by the Engineer. Any cost caused by defective or ill-timed work shall be borne by the installation Contractor.
- C. Each Contractor shall arrange his work and dispose of material so as not to interfere with the work or storage of materials of others. Each Contractor shall join their work to that of others in accordance with the intent of the Project Drawings and Specifications.
- D. All trades shall work in cooperation with each other, and fit their work into the structure as job conditions may demand. All final decisions as to right-of-way and run of pipes and ducts, etc. shall be made by the Engineer or an authorized representative.
- E. It shall be the responsibility of the Contractor to keep constant check on the progress of the work so each particular trade can insure proper preparation for installation of that trade's work and not cause delay in the progress of the work. It shall further be the responsibility of the Contractor to periodically make inspection of work in progress and to notify the Engineer when work is complete in compliance with the Project Drawings and Specifications.

1.09 ACCESSIBILITY

- A. Provide access panels to valves, dampers, controls and equipment in walls or above inaccessible ceiling.

1.10 CLEAN-UP

- A. Remove all dust, plaster and construction debris from fixtures, equipment and control devices prior to painting or occupancy by Owner.
- B. Brush clean and apply one coat of rust-resistant paint to all new piping, pipe fittings and weld joints that have rusted during construction, prior to applying pipe insulation.
- C. All piping, pipe covering and ductwork shall be covered and protected from plaster, dust, paint droppings and other construction debris during construction.
- D. Paint all new equipment, which has rusted or had finish marred during construction to the satisfaction of Engineer. Replace if satisfactory restoration cannot be made.

1.11 OPERATING INSTRUCTIONS

- A. Deliver to the Owner, Maintenance and Operating Instruction, with replacement parts list, for all fixtures and equipment.
- B. Include a complete lubrication and maintenance schedule for all new equipment, with types of lubricants and frequencies recommended.
- C. Instruct and demonstrate to the Owner or his representative the operation and servicing (normal maintenance) of all equipment and systems provided. Use qualified manufacturer's representatives to explain heat or cold generation and temperature control equipment.

1.12 SYSTEM START-UP

- A. The mechanical systems included in the construction documents are to be complete and operating systems. The system start-up, testing, balancing, and satisfactory system performance is the responsibility of the Contractor. This shall include all calibration and adjustments of controls, noise level adjustments and final comfort factor adjustments that may be required.
- B. The Contractor shall adjust the mechanical systems and controls at season changes during the one-year warranty period, as required, to provide satisfactory operation and to prove performance of system used in all seasons.
- C. All operating conditions and control sequences shall be simulated and tested during the start-up period. Testing shall also include all interlocks, safety shutdowns, damper position controls, and alarms.

END OF SECTION

SECTION 23 11 26
FACILITY LIQUEFIED-PETROLEUM PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Propane gas piping system.
- B. Valves.
- C. Gas Regulator

1.02 SUBMITTALS

- A. Product Data: Provide data on valves and accessories. Provide manufacturer's catalog information. Indicate valve data and ratings.

1.03 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

1.04 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with all applicable local, state, and federal codes.
- B. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 - PRODUCTS

2.01 PROPANE GAS PIPING BELOW GRADE

- A. Polyethylene Pipe, Tubing, and Fittings: ASTM D 2513 and as recommended by the manufacturer for use with LP gas.
- B. Polyethylene pipe and fitting joints shall be by heat fusion or factory assembled transition fittings.

- C. Contractor shall provide suitable transition coupling at building steel to polyethylene connection.
- D. Contractor shall bury a tracer wire with the underground polyethylene pipe.
- E. Contractor shall provide a cap or closure for any abandon underground polyethylene pipe.

2.02 PROPANE GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53 or A120, Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234, forged steel welding type.
 - 2. Joints: NFPA 58, threaded or welded.

2.03 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2 inches and Under:
 - 1. Ferrous pipe: 150-psi malleable iron, ground joint, threaded unions.
- B. Pipe Size Over 2 inches:
 - 1. Ferrous pipe: 150 psi forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets.

2.04 PLUG VALVES

- A. Manufacturers:
 - 1. Powell
 - 2. Lunkenheimer
 - 3. Crane
- B. Up to and including 2 inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends.

2.05 GAS REGULATOR

- A. Contractor to install gas regulator inside the generator enclosure.
- B. Locate gas regulator as shown on drawings.
- C. Coordinate and maintain 5-foot separation from air intakes, building openings, and ignition sources per NFPA 58.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Provide piping connections to equipment with flanges or unions.
- D. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- E. Route piping in orderly manner and maintain gradient.
- F. Group piping whenever practical at common elevations.
- G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- H. Provide clearance for installation of insulation and access to valves and fittings.
- I. Exercise all necessary care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not erect or install any item that is not clean.
- J. Run pipelines straight and true, parallel to building lines with a minimum use of offsets and couplings. Provide only such offsets as may be required to provide necessary headroom or clearance and to provide necessary flexibility in pipelines.
- K. Changes in direction of pipelines shall be made only with fittings or pipe bends. Changes in size shall be made only with fittings. Miter fittings, face or flush bushings, or street elbows shall be used. All fittings shall be of the long radius type, unless otherwise shown on the drawings or specified. Welded elbows of angles that are not available as standard elbows to form smooth, long radius fittings.
- L. Arrange piping and piping connections so that equipment being served may be serviced or totally removed without disturbing piping beyond final connections and associated shut-off valves.
- M. All pipes shall be cut to exact measurement and installed without springing or forcing except in the case of expansion loops where cold springing is indicated on the drawings.
- N. Particular care shall be taken to avoid creating, even temporarily, undue loads, forces or strains on valves, equipment to building elements with piping connection or piping supports.
- O. Install valves with stems upright or horizontal.
- P. Provide a tracer wire for all underground nonmetallic piping

3.02 PROPANE GAS PIPING SYSTEMS

- A. System shall be approved by Iowa State Plumbing Code.
- B. Provide unions, at piping connections to all equipment, control valves, etc.
- C. Use dielectric unions for connecting dissimilar piping materials, copper, steel, or cast iron pipe, or fittings. Do not support metal piping with dissimilar/incompatible materials.

- D. Provide metal support affixed to building. Wood supports, acceptable on concrete pads, shall be of treated wood.
- E. Seal all openings around piping and pipe sleeves penetrating walls, floors and ceiling, including areas above suspended ceilings.
- F. Branch connections shall be made with standard tee or cross fittings of the type required for the service unless otherwise specified herein or detailed on the drawings.
- G. Threaded Joints:
 - 1. Ream pipe ends and remove all burrs and chips formed in cutting and threading.
 - 2. Protect plated pipe and valve bodies from wrench marks when making up joints.
 - 3. Apply Teflon tape thread lubricant to male threads.
- H. After installation, clean all metal pipes and fittings of rust and scale; then coat with Black paint.

3.03 PIPING SYSTEM TESTING

- A. Testing shall be conducted in the presence of the Owner's representative, the Engineer or their representative. Contractor shall notify the Engineer of proposed tests at least two days prior to testing.
- B. Respective piping Contractor shall provide all equipment required to conduct tests.
- C. Submit report of test results to the Owner and Engineer.
- D. Piping systems shall be tested as scheduled below, but not less the 50 percent above the operating pressure of the system.

System	Test	Test Pressure	Hold Period	Permissible Pressure Drop
Propane Gas	Pneumatic	3 psi inside 15 psi outside	2 hrs.	None

- E. All defects discovered during the tests shall be immediately corrected and piping system shall be retested until it qualifies. Defective joints found in welded piping shall be ground off and rewelded; screwed and soldered joints shall be disassembled, cleaned and rejoined as a new joint.
- F. Piping connected to specialties, or equipment with a lower pressure rating than specified test, shall be left unconnected or valve-off during test.
- G. After testing is completed on gas systems, fill system with gas and soap test all joints for leaks; or test with gas detection meter.

END OF SECTION

DIVISION 26

ELECTRICAL

SECTION 26 00 00
GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes all materials, equipment, and labor necessary for the installation of electrical systems.

1.02 CODES AND STANDARDS

- A. All materials supplied and all work performed shall comply with the latest revisions of applicable codes and standards of the following organizations:
 - 1. National Electric Code (NEC)
 - 2. National Fire Protection Association (NFPA)
 - 3. American National Standards Institute (ANSI)
 - 4. National Electric Manufacturers Association (NEMA)
 - 5. American Society for Testing and Materials (ASTM)
 - 6. Underwriters' Laboratories (UL)
 - 7. Institute of Electrical and Electronic Engineers (IEEE)
 - 8. Occupational Safety and Health Act (OSHA)
 - 9. All state and local codes as they apply.

1.03 GENERAL

- A. Contract Requirements
 - 1. Division 26 of the specifications covers the electrical systems of the project. It includes work performed by the electrical trades as well as trades not normally considered as electrical trades. These specifications are not intended to establish as a bill of material list for items required by the Contract, but are intended to establish material and performance standards
 - 2. Comply with all provisions of the Contract Documents including General Conditions, Supplementary General Conditions, and Division 1 of the specifications.
- B. SCOPE
 - 1. Provide all items and work indicated on the drawings and called for in the specifications. This includes all incidentals, equipment, appliances services, hoisting, scaffolding, supports, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide complete systems. Perform start-up and checkout on each item and system to provide fully operable systems.

2. It is the intent of the drawings and specifications to provide a complete workable system ready for the Owner's operation. Any item not specifically shown on the drawings or called for in the specifications, but normally required to conform with the intent, are to be considered a part of the Contract. Certain terms such as "shall, provide, install, complete, start up" are not used in some parts of these specifications. This does not indicate that the items shall be less than completely installed or that systems shall be less than complete.
3. Examine and compare the electrical drawings and specifications with the drawings and specifications of other trades, and report any discrepancies between them to the Engineer and obtain from him written instructions for changes necessary in the work. At time of bid the most stringent requirements must be included in said bid.
4. Install and coordinate the electrical work in cooperation with other trades installing inter-related work. Before installation, make proper provisions to avoid interferences in a manner approved by the Engineer.
5. The electrical work includes, but is not limited to the following:
 - a. Demolition of existing electrical connections, equipment and devices necessary to accomplish reconfiguration of feeders.
 - b. Temporary power and lighting system.
 - c. Reconfiguration of electrical service entrance, metering and grounding.
 - d. Replacement of distribution panelboard feeders as necessary to accomplish reconfiguration.
 - e. Installation of branch circuit wiring and devices (Conduit, boxes, conductors, etc.) for generator support requirements.
 - f. Rough in and connection to equipment as indicated on plans.
 - g. Coordination with local utility for service rework and switchover outage.
6. Work Not Included:
 - a. Vending equipment installation and connection.
 - b. Low voltage signal/communication equipment (telephone, computer, security, weather reporting system, etc.) installation or wiring.
 - c. Temperature control equipment and wiring.
 - d. Equipment painting (other than touch-up).
 - e. 15kV power service work shall be by local utility.

C. FEES

1. All local fees, permits and services of inspection authorities shall be obtained and paid for by the Contractor.
2. All bids shall include a \$5,000 allowance for each Circa 1965 building site (3 sites total) for utility service and transformer relocations.
3. All bids shall include a \$1,500 allowance for each Circa 2000 building site for utility activity.

D. DEFINITIONS

1. The following definitions are utilized within the drawings specifications:

- a. "PROVIDE" means to supply, purchase, transport, place, erect, and connect. Test and turn over to the Owner, complete and ready for regular operations, the particular work referred to.
- b. "INSTALL" means to join, unite, fasten, link, attach, set up or otherwise connect together before testing and turning over to the Owner, complete and ready for regular operation, the particular work referred to.
- c. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories and all other items customarily required to the proper and complete application for the particular work referred to.
- d. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such work.
- e. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
- f. "AS DIRECTED" means as directed by the Engineer, or his representative.
- g. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed within hung ceilings.

- 2. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.

E. CONTRACT DRAWINGS AND SYMBOLS

- 1. The electrical drawings listed in the Drawing Index, together with these specifications, are an integral part of the Electrical contract, what is called for in one is as binding as if called for in both. In case of conflict, the greater quantity shall prevail, subject to the approval of the Architect-Engineer.
- 2. The drawings are as accurate as planning can determine; however, field verification of all dimensions is directed. Specifications and drawings are for assistance and guidance, but exact locations, distances and levels shall be governed by field conditions.
- 3. The electrical drawings are diagrammatic only, but shall be followed as closely as actual construction of the building and work of other trades will permit. All changes from these drawings, necessary to adapt the work of other trades and to make the work of this Contractor conform to the building as constructed shall be made by the Electrical Contractor.
- 4. Field verify all measurements prior to installation. Electrical drawings shall not be scaled for the purpose of equipment installation, all measurements being derived from Architectural plans and shop drawings.
- 5. The graphic symbols in the "Electrical Symbols Schedule" list on the drawings have been used in part or in whole in the preparation of the electrical drawings accompanying these specifications.
- 6. Riser diagrams and key plans are shown only as a convenience to the Contractor and Electrician making the installation. In case of conflict between a Riser diagram and a floor plan, the greater quantity or better quality shall prevail and shall be subject to the approval of the Architect-Engineer.

7. The locations of lighting fixtures, outlets, panels and other equipment indicated on the drawings are approximately correct. Locations are understood to be subject to revision as may be found necessary or desirable at the time the work is installed in order to meet field conditions or to coordinate with modular requirements of ceilings. Any significant changes in location of outlets, cabinets, etc., necessary in order to meet field conditions shall be brought to the immediate attention of the Engineer and receive his approval before such alterations are made.
8. Exercise particular caution with reference to the location of panels, equipment, switches, etc. Have precise and defined locations approved by the Engineer before proceeding with the installation.
9. The drawings generally do not indicate the exact number of wires in each conduit for the branch circuit wiring of fixtures, and outlets, or the actual circuiting. Provide the correct wire size and quantity as required by the indicated circuiting and/or circuit numbers indicated and control, wiring diagrams, if any, specified voltage drop or maximum distance limitations, and the applicable requirements of the NEC. Derate in the manner discussed in specification Section 26 05 13 - Wires and Cables.
10. Adjust location of conduits, panels, equipment, pull boxes, fixtures, etc. to accommodate the work to prevent interferences, both anticipated and encountered. Determine the exact route and location of each raceway prior to fabrication.
11. Right-of-Way: Lines that pitch to have the right-of-way over those which do not pitch. For example: steam, condensate, and plumbing drains normally have the right-of-way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
12. Make offsets, transitions and changes in direction in raceways and as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the drawings.
13. Wherever the work is of sufficient complexity, prepare additional detail drawings to scale similar or larger than the bidding drawings, prepared on tracing medium of the same size as Contract drawings. Such detailed work to be clearly identified on the drawings as to the area to which it applies. With these layouts, coordinate the work with the work of other trades.

F. COORDINATION OF THE WORK

1. Coordinate and install the electrical work in cooperation with other trades. Before installation, make provisions to avoid interferences. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto, including equipment areas, chases and finished suspended ceilings.
2. The Contractor shall furnish services of an experienced Superintendent, who shall be in constant charge of all work, and who shall coordinate his work with the work of other trades. No work shall be installed before coordinating with other trades.

3. Coordinate, project and schedule work with other trades in accordance with the construction sequence. Transmit to other trades all information required for work to be provided under their respective sections in ample time for installation.
4. The Contractor shall order the progress of his work so as to conform to the progress of the work of other trades and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from the defective or ill-timed work performed under this section shall be borne by the Contractor.
5. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Applicable equipment and materials to be listed by Underwriters' Laboratories and manufactured in accordance with ASME, NEMA, ANSI or IEEE standards and as approved by local authorities having jurisdiction.
- B. All materials used shall bear the Underwriters' Laboratory, Inc. label provided a standard has been established for the material in question.
- C. Use only material manufacturers that are listed on the drawings or approved in the specification. If products and materials are not listed in either of the above, use first class products and materials.
- D. All materials and products furnished by the Contractor shall be new and unused (temporary lighting and power products are excluded) and free from defects, damage and corrosion.
- E. All equipment capacities, etc. are listed for job site operating conditions. All equipment sensitive to altitudes or ambient temperatures to be derated and method of derating shown on the shop drawings. Where operating conditions shown differ from the laboratory test conditions, the equipment to be derated and the method of derating shown on shop drawings.
- F. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material shall be the product of one manufacturer throughout. Multiple manufacturers of the same type of equipment will not be permitted.

2.02 SUBMITTAL

- A. Provide submittals to proposed products in the manner as discussed in the "Shop Drawing" discussion of the Supplemental General Conditions.
- B. Provide submittals for Engineer's review for the following products.
 1. Section 26 05 00
 - a. Conduit
 - b. Boxes

2. Section 26 05 13
 - a. 600-volt conductors
 3. Section 26 24 00
 - a. Panelboard breakers
 4. Section 26 28 16
 - a. Disconnect switches
 5. Section 26 45 00
 - a. Connectors (fittings/clamps)
 6. Section 26 36 00
 - a. Transfer switch
 7. Section 26 32 00
 - a. Package Generator
- C. Submittals shall include, but are not limited to, catalog cuts.

2.03 SUBSTITUTION

- A. Substitutions shall be considered at the time of submittal review
- B. Substituted material shall be equal in quality and performance as that material specified.
- C. The Engineer shall determine the quality and performance acceptability of any substitute submitted for review.
- D. The bid price submitted by the Contractor is assumed to include the use of specified material. There shall be no cost adjustment for the use of specified material.

PART 3 - EXECUTION

3.01 GENERAL

- A. Follow manufacturer's instructions for installing, connecting, and adjusting all equipment. Provide one copy of such instructions to the Engineer before installing any equipment. Provide a copy of the instructions at the equipment during any work on the equipment. Provide all special supports, connections, wiring accessories, etc.
- B. Use mechanics skilled in their trade for all work.
- C. Keep all items protected before and after installation.
- D. Before commencing work, examine all adjoining, underlying, etc., work on which this work is in any way dependent for perfect workmanship. Become thoroughly familiar with actual existing conditions to which connections must be made or which must be changed or altered. Report any condition which prevents performance of first class work.
- E. Perform all tests required by local authorities in addition to tests specified herein, such as life safety systems.

3.02 DEMOLITION AND CONTINUANCE OF EXISTING SERVICES

- A. Coordinate demolition with all trades and Owners. Existing building electrical shall be removed as required to achieve final result of One-Line diagram for site.
- B. Should any existing services, etc., interfere with new construction, the Electrical Contractor shall alter or reroute such existing equipment to facilitate new construction.
- C. Coordinate electrical outages with Owner's representative prior to any interruption in electrical service.

3.03 CLEANING UP

- A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean, subject to the Engineer's instructions, which shall be promptly carried out.
- B. Contractor shall clean all fixtures and equipment at the completion of the project.
- C. All panelboards, wireways, cabinets, enclosures, etc. shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. The Engineer as required shall open equipment for observation.

3.04 TESTING

- A. Complete testing of equipment and systems shall be provided in accordance with the Contract Documents.
- B. Notify the Engineer seven days prior to the test dates. If the Engineer so elect not to witness a specific test, a statement of certification must be forwarded to the Engineer for approval.

3.05 INSPECTIONS

- A. The Contractor shall see that local inspection authorities are notified when inspections are required by code.
- B. The Contract shall provide all necessary assistance to the Inspector when he is making an inspection.

3.06 RECORD OF CHANGES

- A. The Contractor shall maintain at the job site a complete set of electrical plans upon which he shall clearly mark and note in complete detail any changes made to the location and arrangement of electrical equipment, devices and wiring as a result of building construction conditions and change orders. Revisions shall be made daily when they occur.
- B. The Record Drawings shall record all changes from the original drawings and all pertinent information not shown on the original drawings to include:
 - 1. Addenda and change order revisions.
 - 2. Route and location of all underground and concealed feeders.

3. Interconnecting conduit between branch circuit items, junction boxes and panels. Actual route of conduit is not required, only how the various branch items are interconnected.
 4. Circuit numbers for all items where they do not agree with the plans. Circuit numbers on record drawings and panelboard directories must agree.
- C. The Contractor shall prepare "as-built" drawings as required by the Contract Documents. At a minimum, provide one set of construction drawings which clearly and legibly indicate the information required in Paragraph B. Above for record drawings. The "as-built" drawings will be marked "AS-BUILT Drawings" near the title block and dated on each drawing before being turned over to the Owner at the completion of the project.

3.07 PROJECT CLOSEOUT

- A. Provide project closeout documents in accordance with the Contract Documents. See Division 1 - Requirements.
- B. Provide two copies of maintenance and operation manuals consisting of all approved shop drawings and manufacturer's installation and operation instructions shipped with the equipment. Shop drawings and manufacturer's instructions shall be consolidated into a single 3-ring binder for electrical equipment.

END OF SECTION

SECTION 26 05 00
CONDUIT AND ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes furnishing and installing all conduits, fittings, and accessories as specified or indicated.

1.02 QUALITY ASSURANCE

- A. Applicable standards shall be latest revisions, supplements, and amendments to the following:

1. National Electrical Code (NEC).
2. Underwriters' Laboratories, Inc. (UL):
 - a. UL-6 - Rigid Metallic Electrical Conduit.
 - b. UL-467 - Electrical Grounding and Bonding Equipment.
3. American National Standards Institute, Inc. (ANSI):
 - a. C80.1 - Rigid Steel Conduit, Zinc Coated.
 - b. C80A - Fittings for Rigid Metal Conduit and EMT.
4. National Electrical Manufacturers Association (NEMA):
 - a. FB1 - Fittings and Supports for Conduit and Cable Assemblies.

- B. Acceptable Manufacturers:

1. Galvanized Rigid Steel Conduit and Electrical Metallic Tubing:
 - a. Allied Tube and Conduit Corporation.
 - b. Triangle PWC, Inc.
 - c. Republic Steel Corporation.
2. Conduit Fittings for Rigid Metallic Conduit:
 - a. Heavy Duty Fittings:
 - (1) Appleton Electric Company.
 - (2) Crouse-Hinds Company.
 - (3) O.Z. Gedney Company.
3. PVC conduit
 - a. Carbon "PVC Power and Communications Duct"
 - b. CertainTeed Corporation "PVC Utility Duct"
 - c. George-Ingram

PART 2 - PRODUCTS

2.01 DESIGN REQUIREMENTS

- A. UL Listed and labeled on each conduit length, fitting, and accessory.
- B. Sizes of conduit, fittings, and accessories as indicated, specified, or as required by applicable standards or codes.

2.02 RIGID STEEL CONDUIT & FITTINGS

- A. Mild ductile steel, circular in cross section with uniform wall thickness sufficiently accurate to cut clean threads.
- B. Each length threaded on both ends and threads protected by same process as used on each length. Threads cut after protective coatings are applied shall be retreated with the same zinc coating through a second hot-dip process.
- C. All scale, grease, dirt, burrs, and other foreign matter removed from inside and outside prior to application of coating materials.
- D. Galvanized by the hot-dip process as follows:
 - 1. Interior and exterior surfaces coated with a solid, unbroken layer of 99 percent virgin zinc by dipping.
 - 2. Coating not to show fixed deposits of copper after four 1-minute immersions in a standard copper sulfate solution.
 - 3. One coat of zinc chromate finish on inside and outside surfaces to prevent oxidation and white rust.
- E. Couplings, elbows and fittings shall be fabricated, coated and finished by the same process as conduit.
- F. All fittings and couplings are to be full-threaded type, split or setscrew types are not allowed.
- G. Uni-Swivel or Uni-Couple or other similar types of couplings will not be permitted.
- H. Minimum size shall be 3/4 inch nominal diameter.

2.03 ELECTRICAL METALLIC TUBING & FITTINGS

- A. Shall be UL listed.
- B. Shall be steel, zinc coated on the outside, and enamel coated on the inside surface.
- C. Connectors and fittings shall be of the compression type

2.04 PLASTIC/PVC CONDUIT

- A. Fabricated from self-extinguishing high-impact polyvinyl chloride.
- B. Fittings and accessories fabricated from same material as conduit.
- C. Solvent-cement type joints as recommended by manufacturer.
- D. Inside diameter no less than that of rigid steel conduit.
- E. Dielectric strength as minimum of 400 volts per mil.

- F. Rated and labeled for use with 90 degrees C rated conductors.
- G. Each length of conduit furnished with one belled end per length.
- H. To be Schedule 40 unless noted otherwise, or installed under vehicle drives or parking areas. Schedule 80, PVC conduit shall be used in these areas where Schedule 40 exceptions are required or noted.
- I. Flexible nonmetallic conduit (Smurf tube) shall be allowable when encased in concrete or in floor.

2.05 INGROUND HAND HOLES

- A. For reference in event of replacement of field construction damaged units.
- B. Boxes shall be non-corrosion composite material, green in color to blend into grass.
- C. Inside dimensions of hand hole shall be 12 inches by 12 inches with a 12-inch depth, no bottom. Provide extensions as required for a "clean installation".
- D. Shall have a bolt on matching cover.
- E. Shall be a Quazite Model No. PC1212BA12 with a No. PC1212CA00 cover with "Electric" logo on cover; or equal in concrete as 12-inch round with steel lid. Hand-holes for utility primary shall meet local utility requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install all exposed conduits in a neat manner and parallel to or at right angles to building lines and in accordance with the NEC.
- B. Install underground conduits at depths indicated on drawing or as required by the NEC. Shift elevation as required to clear existing underground utilities.
- C. Running threads will not be permitted.
- D. Coat all field cut threads, scars, or abrasions in galvanized conduit with an approved organic zinc rich primer equivalent to Koppers' "Organic Zinc".
- E. Coat all thread connections with anti-oxidizing compound approved by conduit manufacturer. Compound shall be suitable for steel-to-steel, steel-to-aluminum, and steel-to-PVC connections.
- F. Seal all conduit penetrations through concrete floors or walls with non-shrinking grout.
- G. Carefully ream ends of all conduit lengths after cutting to eliminate sharp burrs.
- H. Clean all conduits with swabs and mandrels after installation.
- I. Install a nylon or polypropylene pull rope in all communications conduits (above and below grade) and all spare underground ducts. Cap spare underground ducts for future use.

- J. Conduit fittings shall be installed as specified, indicated, or necessary.
- K. Conduit support system shall be constructed with sufficient rigidity to hold all conduits in permanent and neat alignment.
- L. Conduit support members, clamps, and hardware shall be galvanized steel.
- M. Conduit Types shall be used as follows:
 - 1. Underground or outside conduit, shall be PVC schedule 40 or 80, unless noted as being GRS conduit. Above grade shall be GRS or intermediate grade metal.
 - 2. Flexible nonmetallic shall be allowed when encased in concrete or in floor.
- N. Underground PVC conduits shall transition to galvanized rigid steel conduit before turning up to exit earth or concrete floor.
- O. Install hand holes with the top flush with grade. Install box on 8 inches of crushed compacted rock to support box and to provide drainage. Conduits shall turn up into hand hole with a 90-degree bend. Conduits shall have bushings on ends and protrude 2 inches above gravel. Seal conduit openings with mastic after wires are installed. Empty spare conduits shall be plugged to prevent debris from entering conduits.

END OF SECTION

SECTION 26 05 13
WIRES AND CABLES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes furnishing and installing 600-volt power, control cable, and instrumentation and communication cable.

1.02 QUALITY ASSURANCE

- A. Applicable standards shall be the latest revisions, supplements, and amendments to the following:
1. National Electrical Code (NEC)
 2. Underwriters' Laboratories, (UL) - 1072
 3. Institute of Electrical and Electronics Engineers (IEEE) - 383
 4. Insulated Cable Engineers Association (ICEA) - S48-516
 5. Association of Edison Illuminating Companies (AEIC) - CS6
 6. American Society for Testing and Materials (ASTM) - B8
- B. Acceptable Manufacturers:
1. Pulling Lubricant
 - a. American Polywater Corporation
 - b. Ideal Industries, Inc.
 2. 600 Volt Cable (120/240 volt power and lighting circuits)
 - a. Rome Cable Corporation
 - b. Triangle
 - c. Southwire

PART 2 - PRODUCTS

2.01 PULLING LUBRICANTS

- A. Pulling compound shall be listed by manufacturer as compatible with cable being pulled.
- B. Pulling compound shall contain no waxes, greases, silicones, or polyabkalene glycol oils or waxes.
- C. Pulling compound shall be rated for the air temperature in which the installation is being performed.
- D. Contractor shall follow the manufacturer's recommendation of application of pulling compound if used.

2.02 SINGLE-CONDUCTOR 600-VOLT WIRE

- A. Type THWN Wire (Interconnection Cable for Power, Lighting or Control)
 - 1. Material: Annealed uncoated copper in accordance with ASTM B3.
 - 2. Size: As indicated on the drawings.
 - 3. Description: Single-conductor stranded wire, 600-volt, and 75 degrees C temperature rating.
 - 4. Insulation: Heat- and moisture-resistant thermoplastic.
 - 5. Jacket: Smooth nylon, 4 mils thick (minimum).
 - 6. Identification: Mark surface of wire with manufacturer's identification, conductor size, and voltage rating.
 - 7. Minimum conductor size:
 - a. Power: #12 AWG
 - b. Control circuits: #14 AWG

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Cable shall be stored covered and elevated from ground on blocks to prevent contamination from mud, dirt, or water.
- B. Contractor shall swab and clean each conduit before installation of cable commences. Swab methods shall consist of wire brush and foam swab utilized together in proper size for conduit.
- C. Contractor shall use pulling lubricant as required or recommended by manufacturer to minimize strain on wires or cables.
- D. Ground Cable
 - 1. Reference Section 26 45 00 of this specification for installation of ground cable.
 - 2. Maintain color coding on grounding circuits as follows:
 - a. Green - Equipment grounding conductor.
- E. 600-Volt Cable
 - 1. Install where indicated on the drawings with size as indicated.
 - 2. Power circuit conductors shall be color coded as follows:
 - a. Black - Line 1 or Line 2
 - b. Green - Ground
 - c. White - Neutral
 - 3. 600-volt cable shall be derated for ambient temperature per NEC.

4. 600-volt cable shall be derated for fill by increasing the size to meet the NEC derating percentage stated for the number of current carrying conductors (including all neutral conductors) using the following nonderated schedule:
 - a. 20 amp #12 AWG
 - b. 30 amp #10 AWG
 - c. 50 amp #8 AWG

F. Controls and Instrumental Cable

1. Provide manufacturer's supplied or recommended cable.

END OF SECTION

SECTION 26 24 00
PANELBOARDS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes furnishing and installing all distribution panelboard, as shown on the drawings.

1.02 QUALITY ASSURANCE

- A. Applicable standards shall be the latest revisions, supplements, and amendments to the following:
 - 1. National Electrical Code (NEC).
 - 2. Underwriters' Laboratories (UL).
 - 3. National Electrical Manufacturers Association (NEMA).
 - 4. American National Standards Institute (ANSI).
- B. Acceptable Manufacturers (Determine by equipment at site)
 - 1. General Electric
 - 2. Square D
 - 3. Cutler-Hammer
 - 4. Engineer approved equal

PART 2 - PRODUCTS

2.01 PANELBOARDS

- A. Panelboards shall have main rating, main breaker, number of poles, and branch breakers as shown by the panelboard schedules on the drawings. Panels shall be UL labeled.
- B. 240/120-volt, single-phase, 3-wire panels shall have 100 percent rated neutral bus with a UL series connected rating of 22,000 AIC.
- C. Panelboards shall be equipped with bolt on breakers.
- D. GFI breakers shall be installed where panel schedule calls for ground fault breakers and as by specifications or as per manufacturer's recommended practice.
- E. Breakers shall not be of "Tandem" design.

- F. NEMA classification of panels shall be NEMA 1 unless noted otherwise on the drawings or specifications.

PART 3 - EXECUTION

3.01 GENERAL

- A. Breaker placement shall be as determined to fit panel(s).
- B. Contractor shall TYPE panel schedule on schedule card at the end of the job. Cards shall accurately and clearly reflect the circuits serviced by the breakers.
- C. Modify existing schedule neatly at project completion.

END OF SECTION

SECTION 26 32 00
PACKAGED ENGINE GENERATOR SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section includes:
 - 1. This section describes:
 - a. Packaged engine generator set.
 - b. Radiator.
 - c. Heat exchanger.
 - d. Exhaust silencer and fittings.
 - e. Fuel fittings.
 - f. Control panel.
 - g. Battery and charger.
 - h. Weatherproof enclosure.
- B. Related work specified elsewhere:
 - 1. Section 26 00 00 - Electrical General Provisions
 - 2. Section 26 36 00 - Enclosed Transfer Switch

1.02 REFERENCES

- A. NEMA AB3 - Molded Case Circuit Breakers.
- B. NEMA MG1 - Motors and Generators.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum.)
- D. NFPA 30 - Flammable and Combustible Liquids Code.
- E. NFPA 70 - National Electrical Code.
- F. NFPA 99 - Health Care Facilities.
- G. NFPA 101 - Life Safety Code.
- H. NFPA 110 - Emergency and Standby Power Systems.

1.03 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Shop Drawings: Indicate electrical characteristics and connection requirements. Show plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, and electrical diagrams, including schematic and interconnection diagrams.

- C. Product Data: Provide data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, day tank, and remote radiator.
- D. Test Reports: Indicate results of performance testing.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.04 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division 1.
- B. Operation Data: Include instructions for normal operation.
- C. Maintenance Data: Include instructions for routine maintenance requirements, service manuals for engine and day tank, oil sampling and analysis for engine wear, and emergency maintenance procedures.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with NFPA 110.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience, and with service facilities within 100 miles of Project.
- B. Supplier: Authorized distributor of specified manufacturer with minimum three years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 1.
- B. Accept unit on site on skids. Inspect for damage.
- C. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

1.08 MAINTENANCE SERVICE

- A. Furnish service and maintenance of engine generator for one year from date of Substantial Completion.

1.09 MAINTENANCE MATERIALS

- A. Furnish one set of tools required for preventative maintenance of the engine generator system. Package tools in adequately sized metal tool box.

1.10 EXTRA MATERIALS

- A. Provide two of each fuel, oil and air filter element for engine generator system.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Cummins/Onan
- B. Substitutions: Under provisions of Section 26 00 00. Caterpillar and Kohler are approved manufacturers.

2.02 PACKAGE ENGINE GENERATOR SYSTEM

- A. Description: NFPA 110, engine generator system to provide source of power for Level 2 applications.
- B. Standby System Capacity: Plan stated KW 120 degrees C rise at elevation of 3,000 feet above sea level, rating using engine-mounted radiator engine mounted heat exchanger.

2.03 ENGINE

- A. Type: Water-cooled inline or V-type, two stroke cycle, internal combustion engine.
- B. Rating: Sufficient to operate under 10 percent overload for one hour in an ambient of 90 degrees F at elevation of 3,000 feet.
- C. Fuel System: Propane fuel.
- D. Engine Speed: 1800 rpm.
- E. Governor: Isochronous type to maintain engine speed within 0.5 percent, steady state, and 5 percent, no load to full load, with recovery to steady state within 2 seconds following sudden load changes.
- F. Safety Devices: Engine shutdown on high water temperature, low oil pressure, overspeed, and engine overcrank. Limits as selected by manufacturer.
- G. Engine Starting: DC starting system with positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Include remote starting control circuit, with MANUAL-OFF-REMOTE selector switch on engine-generator control panel.
- H. Engine Jacket Heater: Thermal circulation type water heater with integral thermostatic control, sized to maintain engine jacket water at 90 degrees F, and suitable for operation on 120 volts AC.
- I. Radiator: Radiator using glycol coolant, with blower type fan, sized to maintain safe engine temperature in ambient temperature of 110 degrees F. Radiator air flow restriction 0.5 inches of water maximum.

- J. Engine Accessories: Fuel filter, lube oil filter, intake air filter, lube oil cooler, fuel transfer pump, fuel priming pump, gear-driven water pump. Include fuel pressure gauge, water temperature gauge, and lube oil pressure gauge on engine/generator control panel. Provide means of assuming low temperature starting of vapor propane fuel.
- K. Mounting: Provide unit with suitable spring-type vibration isolators and mount on structural steel base.

2.04 GENERATOR

- A. Generator: NEMA MG1, single-phase, 4-pole, reconnectable brushless synchronous generator with brushless exciter.
- B. Rating: At 0.8 power factor, 120/240 volts, 60 Hz at 1800 rpm.
- C. Insulation Class: F.
- D. Enclosure: NEMA MG1, open drip proof. Provide in manufacturer's standard color of approximate description of "Sand". Standard Green or Yellow are not acceptable.
- E. Voltage Regulation: Include generator-mounted volts per hertz exciter-regulator to match engine and generator characteristics, with voltage regulation plus or minus 1 percent from no load to full load. Include manual controls to adjust voltage droop, voltage level (plus or minus 5 percent) and voltage gain.

2.05 ACCESSORIES

- A. Residential type enclosure to limit sound emissions to 60dB at 300 feet.
- B. Exhaust Silencer: Residential type silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, sized in accordance with engine manufacturer's instructions.
- C. Fuel connection, fittings, and metering connection suitable for supplier.
- D. Batteries: Heavy duty, diesel starting type lead-acid storage batteries, 170 ampere-hours minimum capacity. Match battery voltage to starting system. Include necessary cables and clamps.
- E. Battery Tray: Treated for electrolyte resistance, constructed to contain spillage.
- F. Battery Charger: Current limiting type designed to float at 2.17 volts per cell and equalize at 2.33 volts per cell. Include overload protection, full wave rectifier, DC voltmeter and ammeter, and 120 volts AC fused input. Provide enclosure to meet NEMA 250, Type 1 requirements.
- G. Line Circuit Breaker: NEMA AB 3, molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole, sized in accordance with NFPA 70. Include battery-voltage operated shunt trip, connected to open circuit breaker on engine failure. Unit mount in enclosure to meet NEMA 250, Type 1 requirements.
- H. Engine-Generator Control Panel: NEMA 250, Type 1 mounted control panel enclosure with engine and generator controls and indicators. Include provision for padlock and the following equipment and features:

1. Frequency Meter: 45-65 Hz. range, 3.5 inch dial.
 2. AC Output Voltmeter: 3.5 inch dial, 2 percent accuracy, with phase selector switch.
 3. AC Output Ammeter: 3.5 inch dial, 2 percent accuracy, with phase selector switch.
 4. Output voltage adjustment.
 5. Push-to-test indicator lamps, one each for low oil pressure, high water temperature, overspeed, and overcrank.
 6. Engine start/stop selector switch.
 7. Engine running time meter.
 8. Oil pressure gauge.
 9. Water temperature gauge.
 10. Auxiliary Relay: 3PDT, operates when engine runs, with contact terminals prewired to terminal strip.
 11. Additional visual indicators and alarms as required by NFPA 110.
 12. Remote Alarm Contacts: Pre-wire SPDT contacts to terminal strip for remote alarm functions required by NFPA 110 and include a "proof of run" indication.
 13. Shall include Amp Sentry, single-phase, fault protection.
- I. Annunciator Panel: Surface mounted panel with brushed stainless steel. Provide audible and visible indicators and alarms required by NFPA 110.
1. High battery voltage (alarm).
 2. Low battery voltage (alarm).
 3. Low fuel (alarm).
 4. System ready.
 5. Anticipatory-high water temperature.
 6. Anticipatory-low oil pressure.
 7. Low coolant temperature.
 8. Switch in off position (alarm).
 9. Overcrank (alarm).
 10. Emergency stop (alarm).

11. High water temperature (alarm).
 12. Overspeed (alarm).
 13. Low oil pressure (alarm).
 14. Line power available.
 15. Generator power available.
 16. Lamp test and horn silence switch.
- J. Weather-Protective Enclosure: Reinforced steel housing allowing access to control panel and service points, with lockable doors and panels. Include fixed louvers, battery rack, and silencer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.02 FIELD QUALITY CONTROL

- A. Field testing will be performed by factory trained personnel in the present of an Owner's representative.
- B. Provide full load test utilizing portable test bank, if required, for four hours minimum. Simulate power failure including operation of transfer switch, automatic starting cycle, and automatic shutdown and return to normal.
- C. Record in 20-minute intervals during four hour test:
1. Kilowatts.
 2. Amperes.
 3. Voltage.
 4. Coolant temperature.
 5. Room temperature.
 6. Frequency.
 7. Oil pressure.
- D. Test alarm and shutdown circuits by simulating conditions.
- E. Provide Owner with Test Record.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems per manufacturer's recommended practice.

3.04 ADJUSTING

- A. Adjust work under provisions of Division 1.
- B. Adjust generator output voltage and engine speed.

3.05 CLEANING

- A. Clean work under provisions of Division 1.
- B. Clean engine and generator surfaces. Replace oil and fuel filters.

3.06 DEMONSTRATION

- A. Provide systems demonstration for Owner for demonstration of operation and for training.
- B. Describe loads connected to system and restrictions for future load additions.
- C. Simulate power outage by interrupting normal source, and demonstrate that system operates to provide power.

END OF SECTION

SECTION 26 36 00
ENCLOSED TRANSFER SWITCH

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Automatic transfer switch.

1.02 RELATED SECTIONS

- A. Section 26 00 00 - Electrical General Provisions.
- B. Section 26 32 00 - Package Engine-Generator System.

1.03 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. NEMA ICS 1 - General Standards for Industrial Control and Systems.
- C. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies.
- D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

1.04 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data: Provide catalog sheets showing voltage, switch size, ratings and size of switching and overcurrent protective devices, operating logic, short circuit ratings, dimensions, and enclosure details.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.05 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division 1.
- B. Operation Data: Include instructions for operating equipment. Include instructions for operating equipment under emergency conditions when engine generator is running.
- C. Maintenance Data: Include routine preventative maintenance and lubrication schedule. List special tools, maintenance materials, and replacement parts.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience, and with service facilities within 100 miles of project.
- B. Supplier: Authorized distributor of specified manufacturer with minimum three experiences.

1.07 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 1.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to internal components, enclosure and finish.

1.09 FIELD MEASUREMENTS

- A. Verify that field measurements are as instructed by manufacturer.

1.10 MAINTENANCE SERVICE

- A. Furnish service and maintenance of transfer switch for one year from date of Substantial Completion.

1.11 MAINTENANCE MATERIALS

- A. Provide maintenance materials under provisions of Division 1.
- B. Provide two of each special tool required for maintenance.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Onan
- B. Asco
- C. Kohler
- D. Engineer approved equal by Caterpillar

2.02 AUTOMATIC TRANSFER AND MANUALLY OPERATED SWITCH

- A. Description: NEMA ICS 2, automatic transfer switch with manual maintenance capability.

2.03 SERVICE CONDITIONS

- A. Service Conditions: NEMA ICS 1.
- B. Temperature: 90 degrees F.
- C. Altitude: 3,300 feet.

2.04 RATINGS

- A. Voltage: 240 volts, 1-phase, 3- wire, 60 Hz.
- B. Switched Poles: Two with open transition.
- C. Load Inrush Rating: Combination load.
- D. Continuous Rating: 600 amperes.

2.05 PRODUCT OPTIONS AND FEATURES

- A. Indicating Lights: Mount in cover of enclosure to indicate normal source available, alternate source available, and switch position.
- B. Test Switch: Mount in cover of enclosure to simulate failure of normal source.
- C. Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate to normal source.
- D. Transfer Switch Auxiliary Contacts: 1 normally open; 1 normally closed.
- E. Normal Source Monitor: Monitor normal source voltage and frequency; initiate transfer when voltage drops below 85 percent or frequency varies more than 3 Hertz from rated nominal value.
- F. Alternate Source Monitor: Monitor alternate source voltage and frequency; inhibit transfer when voltage is below 85 percent or frequency varies more than 3 Hertz from rated nominal value.
- G. Switched Neutral: Overlapping contacts.

2.06 AUTOMATIC SEQUENCE OF OPERATION

- A. Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor.
- B. Time Delay To Start Alternate Source Engine Generator: 0 to 5 seconds, adjustable.
- C. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.
- D. Time Delay Before Transfer to Alternate Power Source: 0 to 10 seconds, adjustable.
- E. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.
- F. Time Delay Before Transfer to Normal Power: 0 to 10 seconds, adjustable; bypass time delay in event of alternate source failure.
- G. Time Delay Before Engine Shut Down: 0 to 5 minutes, adjustable, of unloaded operation.
- H. Engine Exerciser: Start engine every 7 days; run for 30 minutes before shutting down. Bypass exerciser control if normal source fails during exercising period.

- I. Alternate System Exerciser: Transfer load to alternate source during engine exercising period.

2.07 ENCLOSURE

- A. Enclosure: NEMA, Type 3R.
- B. Finish: Manufacturer's standard Sand (preferred) or Gray enamel.

2.08 VENDOR SERVICE

- A. 100 Amp unit for vendor building or interior vendor panel may be a residential grade switch.
- B. The Circa 2000 building may have sufficient space within the building to mount this switch. Contractor is encouraged to work with Owner to facilitate this occurrence at the Cedar and Scott sites.
- C. If this switch is interior-mounted to the building, NEMA 1 enclosure is acceptable with a lockable front.
- D. Interior-mounted units shall be set to not transfer power to vendor panel during weekly test.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify conditions.
- B. Verify that surface is suitable for transfer switch installation.

3.02 INSTALLATION

- A. Install transfer switches in accordance with manufacturer's instructions.
- B. Provide engraved plastic nameplates with 1/4-inch lettering and attach with mechanical fastening and nameplate adhesive.
- C. Ensure that switch mounting is secure to building structure or floor.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems under provisions of Division 1.

3.04 DEMONSTRATION

- A. Provide systems demonstration under provisions of Division 1.
- B. Demonstrate operation of transfer switch in normal and emergency modes.

END OF SECTION

SECTION 26 45 00
GROUNDING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes furnishing and installing copper grounding cable for the equipment and structures.

1.02 QUALITY ASSURANCE

- A. Applicable standards shall be the latest revisions, supplements, and amendments to the following:
1. National Electrical Code (NEC).
 2. American Society for Testing and Materials (ASTM) - B8.
 3. National Electrical Safety Code (NESC).
- B. Acceptable Manufacturers
1. Ground Clamps and Bars
 - a. Burndy Corporation
 - b. Thomas & Betts Company
 2. Grounding Lugs and Grounding Splice Connectors
 - a. Burndy Corporation
 - b. Thomas & Betts Company
 - c. Anderson

PART 2 - PRODUCTS

2.01 GROUNDING SYSTEM

- A. Cable to equipment grounds shall be with compression type bolted lug connections. Lugs shall be copper, tin plated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Contractor shall ground all equipment as shown on the drawings. Ground shall be in conformance with the NEC.
- B. Contractor shall remove all paint, rust, or other non-conducting material from grounding contact surfaces before making connections.
- C. There shall be no splicing of grounding electrode cables unless it is shown on the drawings or approved by the Owner.

END OF SECTION

DIVISION 31

EARTHWORK

SECTION 31 11 00

CLEARING AND GRUBBING

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Remove shrubs within the construction area and/or as indicated.
- C. Related Sections and Work:
 - 1. Excavating, Stripping Topsoil, Filling, Grade: Division 31.

1.02 PROTECTION

- A. All remaining portions of property not scheduled for clearing and grubbing shall be completely protected during clearing and grubbing and removal of material. Any resulting damage shall be repaired or replaced to like new condition by the Contractor responsible.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide all barricades, fences, and warning lights as required to protect persons and property in accordance with all applicable Iowa DOT Specifications and regulations.

PART 3 EXECUTION

3.01 CLEARING/PROCEDURE

- A. In all activities, comply with pertinent regulations of governmental agencies having jurisdictions.
- B. Clearing and Grubbing:
 - 1. Protect all trees and other plant life which are subject to damage during construction.
 - 2. No burning on site permitted.
- C. Disposal of Materials:

1. All material shall become property of the Contractor and shall be removed from the Owner's site by the Contractor. No prolonged accumulation of debris will be allowed.
 - a. Remove all material from the site as removed. Storage of material on the site will not be allowed.
- D. Maintaining Traffic:
1. Ensure minimum interference with roads, driveways, sidewalks, and adjacent facilities.
 - a. Coordinate with Contractor staging requirements and areas defined on drawings.
 2. Do not close or obstruct roads, driveways, and sidewalks without permission from authorities having jurisdiction.
 3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

3.03 CLEAN UP/ACCEPTANCE

- A. Clean up trash and debris caused by clearing operations under this section, keeping premises, roads, and adjacent property clean and neat at all times.

END OF SECTION

SECTION 31 23 00

EXCAVATION AND FILL

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Excavation, backfill, and fill.
 - a. Compaction of materials relative to its placement.
 - 2. All excess material shall be removed from the site.
 - 3. Supply all additional material required to complete the earthwork as indicated on the drawings or herein specified.
 - 4. Provide field-testing, approvals, and reports as herein specified.
 - 5. Note: Ground water could possibly be encountered during excavation.
 - 6. This Contractor shall provide and maintain all erosion and sediment controls, silt fencing and bale check required by governing authorities.
 - a. Coordinate providing this work with all other excavation and earth moving sections of work.

1.02 RELATED SECTIONS

- A. Excavation, filling, compacting required in connection with utility work, and mechanical and electrical work: Divisions 23 and 26.

1.03 QUALITY ASSURANCE

- A. Required Testing:
 - 1. The Owner reserves the right to require and pay for field tests performed by an Iowa licensed professional Engineer. The engineering testing (geotechnical) firm, that shall make the following tests and/or special inspections for compliance with this section of work. The Contractor shall give the testing Engineer/firm a 24-hour notice prior to a required test(s).
 - 2. Excavation Testing:
 - a. Verify that the bottom of all excavations shall be undisturbed stable soils capable of providing the bearing capacity for the item it is supporting.
 - 3. Fill Testing:
 - a. Verify that the bottom of all backfill excavations is free of unstable soil before filling is commenced.
 - b. Perform density tests on all backfill.
 - c. Location of the test shall be as directed by the testing Engineer/firm.

4. The test results shall confirm the required density, compaction, and bearing specified. If the tests are below these requirements, the Contractor shall remove, refill, recompact, and test again at his/her own expense until the specified requirements are achieved.

1.04 PROTECTION

- A. Protect all utilities against damage.
- B. Provide all required barricades and post warning lights for safety of persons.
- C. Protect structures, utilities, and other facilities immediately adjacent to excavations from damage caused by settlement, lateral movement, undermining, washout and other hazards.
 1. Contractor is entirely responsible for strength and adequacy of bracing and shoring, and for safety and support of construction from damage or injury caused by the lack thereof or by movement or settlement.
- D. Comply with all applicable statutes, ordinances, codes and regulations regarding safety and health including local, state, federal and OSHA (Occupational Safety and Health Administration) jurisdictions.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Backfill: All material placed in excavations outside the structure limits is classified as "backfill."
 1. Clean earth free of organic materials.
 2. No solid material larger than 6" in its largest dimension shall be allowed.
 3. Excavated material, below topsoil, from the site is acceptable for backfill.
- B. Granular fill or fill: Material placed under construction is classified as "fill."
 1. Clean, granular fill, with no more than 5 percent of material passing a No. 200 sieve shall be placed immediately under the generator pad and adjacent PCC.
 2. The first 6" of fill immediately under sidewalks shall be clean granular fill.
- C. Topsoil: Topsoil is to be black, fertile and native to the area, free of stones, lumps, clods, plants, roots, sticks or other extraneous materials.
 1. Provide 6" minimum topsoil under all sodded, seeded, or planted areas.
- D. Barricades, fences, warning lights as required to protect persons and property, shall be in accordance with all applicable codes and regulations.

PART 3 EXECUTION

3.01 INSPECTION

A. Existing Utilities:

1. Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during excavation operations.
2. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Engineer immediately for directions as to procedure. Cooperate with the Owner, and public and private utility facilities in operation. Repair damaged utilities to the satisfaction of the utility owner.
3. Do not interrupt existing utilities serving facilities occupied and used by the owner or others, except when permitted in writing by the Engineer and then only after acceptable temporary utility services have been provided.

3.02 INSTALLATION/PROCEDURE

A. Stripping:

1. Strip all black dirt and topsoil to its entire depth, 6" minimum, from areas to be covered by exterior concrete and from areas to be cut or filled.
 - a. Areas to be stripped shall first be scraped clean of all brush, weeds, grass, roots and other materials. This material shall be removed off-site.
 - b. Stockpile the topsoil obtained on the site using care not to mix with subsoil. Pile in locations where it will not interfere with the building or construction operations.
 - c. This black dirt is to be spread as indicated under grading of this section.
 - d. Excess topsoil may be used for general fill for grading except not under any form of construction.

B. General Excavation:

1. Excavate for all subgrade work shown or specified to dimensions indicated, plus sufficient space to permit erection of forms and shoring.
 - a. Do all excavation of every description and of whatever substances encountered to dimensions and elevations indicated and/or specified herein, unless otherwise qualified herein.
2. Contractor shall be responsible to keep all excavations free of water during the entire process of work regardless of cause, source or nature of the water. Dewatering in order to complete this section of work shall be considered incidental to the earthwork.
3. Provide all shoring and bracing necessary to prevent cave-in of excavations or damage to structure. Remove shoring and piling before backfilling is completed, but not until permanent supports are in place.
4. Unauthorized Excavation: If materials are removed beyond indicated subgrade elevations or side dimensions, fill at no extra cost to the owner.
5. Removal of Unsatisfactory Soil Materials:

- a. Excavate unsatisfactory soil materials encountered that extend below the required elevations, to the additional depth directed by the Engineer or Geotechnical Engineer.
- b. Such additional excavation, provided it is not due to the fault or neglect of the Contractor, will be measured as directed by the Engineer and paid for as a change in the work.

C. Filling and Backfilling:

1. Place backfill and fill materials in layers not more than 8" in loose depth. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content of the soil material. Compact each layer to the required percentage of maximum density for each area classification.
2. Do not place backfill or fill material on surfaces that are muddy, frozen or contain frost or ice.
3. The finished compacted areas shall be brought to a reasonable true and even plane at the required elevations and shall be approved by the Engineer prior to further construction operations thereon.
4. Place backfill and fill materials evenly adjacent to structures, to the required elevations. Take care to prevent wedging action of the backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift. Provide bracing to maintain the structure true to required form.
5. Use power-drive hand tampers for compacting materials adjacent to structures.
6. All exterior concrete slabs on grade shall be placed on a bed of sub-base material as specified, compacted as specified, evenly graded and free from all rubbish and debris.

D. Compaction:

1. Control soil compaction during construction for compliance with the percentage of maximum density specified for each area classification.
2. Provide not less than the percentages of the maximum standard proctor density, ASTM D 698, of the same soil material compacted at optimum moisture content, for the actual density of each layer of soil material-in-place.
3. Where the subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply the required amount of water to the surface of subgrade, or layer of soil material in such a manner as to prevent free water appearing on the surface during or subsequent to compaction operations.
4. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified percentage of maximum density.
5. When the existing ground surface has a density less than that specified under "Compaction" for the particular area classification, break up the ground surface, pulverize, moisture condition to the optimum moisture content and compact to the required depth and percentage of maximum density.
6. Where completed areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, re-shape and compact to the required density prior to further construction. Use hand tamping for recompaction over underground utilities, if any.

7. Compaction over ditches less than 3 feet in width and around perimeter of walls and columns for distance of 3 feet from the wall or column shall be done by the use of mechanical hand compactors such as a Jackson Compactor.
- E. Grading:
1. Do all cutting, filling, compacting of fills and grading required to bring the entire project area, outside of buildings to subgrades as follows:
 - a. For surfaced areas (roadways, parking areas, curbs, service courts, steps and walks) to the underside of the respective surfacing, sub-base or base course, as fixed by the finished grades.
 - b. For lawn and planted areas, to 6" below finished grade. Fill and finish grade of such areas with topsoil to bring grade to elevations shown.
 - 1) Topsoil shall be prepared smooth, to final grade and loosened, ready to receive sod or seeding.
 - c. Slope uniformly to meet elevations at walks, drives, etc., and so as to prevent water pockets or irregular surface changes. The subgrade shall be sloped to provide drainage away from the building walls in all directions.
- F. Remove all waste materials, including excavated material classified as unsatisfactory soil material, trash and debris from the owner's property and legally dispose of it.
- G. Maintaining Traffic:
1. Ensure minimum interference with roads, sidewalks and adjacent facilities.
 2. Do not close or obstruct roads or passageways without permission from the Engineer.
 3. If required by the Engineer, provide alternate routes around closed or obstructed traffic ways.

3.03 CLEAN UP/ACCEPTANCE

- A. Protect newly graded areas from traffic and erosion, and keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded and rutted areas to the specified tolerances.
- C. Keep all travel routes free of tracked or spilled materials.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Trenching, backfilling, and compacting for all underground utility lines and services including but not limited to the following:
 - a. Gas lines.
 - 2. All excess material shall be removed from the site.
 - 3. Provide all additional material required to complete the work for this Section as indicated or required.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Backfill Materials: All material placed in trench excavations is classified as "backfill."
 - 1. Clean earth graded and free of organic materials.
 - 2. No solid material larger than 6" in its largest dimension shall be used.
 - 3. Excavated material, below topsoil, from the site is acceptable for backfill.
 - 4. Backfill beneath and within 5' of pavement areas shall be Special Backfill in accordance with Section 4132 of the Standard Specifications.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Utilities:
 - 1. Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the Contracting Authority.
 - 2. If active utility lines are encountered and are not shown on the Drawings, or otherwise made known to the Contractor, promptly take necessary steps to assure that the service is not interrupted.
 - 3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at not additional cost to the Contracting Authority.

4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure his instructions.
 5. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.
- B. Protection of Persons and Property:
1. Barricade open holes and depressions occurring as part of the work, and post warning lights on property adjacent to or with public access.
 2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
 3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.
- C. Dewatering:
1. Remove all water, including rainwater, encountered during trench and substructure work to an approved location by pumps, drains, and other approved methods.
 2. Keep trenches and site construction area free from water.
- D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- E. Maintain access to adjacent areas at all times:
- F. Trenching:
1. Contractor shall provide all necessary protection of the work and for the safety of personnel.
 - a. Prior to backfilling, remove all such protection materials.
 - b. Do not permit such protection materials to remain in the trenches, except when in the opinion of the Engineer, field conditions or the type of materials are such as to make removal of materials impractical. In such cases, the Engineer may permit portions of material to remain in the trench.
 2. Open Cut:
 - a. Excavate for utilities by open cut, except where installation by directional borings are noted otherwise on the Drawings.
 - b. If conditions at the site prevent such open cut and if approved by the Engineer, trenching may be used.
 - c. Short sections of a trench may be tunneled if, in the opinion of the Engineer, the conductor may be installed safely and backfill can be compacted properly into such tunnel.
 - d. Where it becomes necessary to excavate beyond the limits of normal excavation lines in order to remove boulders or other interfering objects, backfill the voids remaining after removal of the objects as directed by the Engineer.

- e. When the void is below the subgrade for the utility bedding, use suitable earth materials and compact to the relative density directed by the Engineer, but in no case to a relative density less than 90 percent.
- f. When the void is in the side of the utility trench or open cut, use suitable earth or sand compacted or consolidated, as approved by the Engineer, but in no case to a relative density less than 80 percent.
- g. Remove boulders and other interfering objects, and backfill voids left by such removal at no additional cost to the Contracting Authority.
- h. Excavating for Appurtenances:
 - 1) Excavate for manholes and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.
 - 2) Overdepth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel, or lean concrete as directed by the Engineer, and at no additional cost to the Contracting Authority.
- 3. Trench to the minimum width necessary for proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing for the utility.
- 4. Depressions:
 - a. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.
 - b. Except where rock is encountered, do not excavate below the depth indicated or specified.
 - c. Where rock is encountered, excavate rock to a minimum overdepth of 4" below the trench depth indicated or specified.
- 5. Where utility runs traverse public property or are subject to governmental or utility company jurisdiction, provide depth, bedding, cover, and other requirements as set forth by legally constituted authority having jurisdiction, but in no case less than the depth shown in the contract documents.
- 6. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace the turn upon completion of the backfilling.
- 7. Cover:
 - a. Provide minimum trench depth indicated below to maintain a minimum cover over the top of the installed item below the finish grade or subgrade.
 - 1) Areas subject to vehicular traffic:
 - a) As shown on the Drawings.
 - 2) Areas not subject to vehicular traffic:
 - a) As shown on the Drawings.
 - 3) All areas:
 - a) Gas Lines – as shown on the Drawings.

G. Backfilling:

- 1. General:
 - a. Except as otherwise specified or directed by special conditions, backfill trenches to the ground surface with selected material approved by the Engineer.

- b. Re-open trenches which have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified, or otherwise correct, to the approval of the Engineer.
- 2. Lower Portion of Trench:
 - a. Deposit approved backfill and bedding material in layers of 6" maximum thickness, and compact with suitable tampers to the density of the adjacent soil or grade, as specified herein, until there is a cover of not less than 12" over utility lines.
 - b. Take special care in backfilling and bedding operations to not damage pipe and pipe coatings.
- 3. Remainder of Trench:
 - a. Except for special materials for pavements, backfill the remainder of the trench with material free from stones larger than 6" or half the layered thickness, whichever is smaller, in any dimension.
 - b. Deposit backfill material in layers not exceeding the thickness specified, and compact each layer to the minimum density directed by the construction soil engineer.
- 4. Adjacent to Buildings: Mechanically compact backfill within 10' of buildings.
- 5. Under or Within 5' of Pavement: Backfill shall be granular material mechanically compacted.
- 6. Consolidation of backfill by jetting with water may be permitted, when specifically approved by the Engineer, in areas other than building and pavement areas.

3.02 FIELD QUALITY CONTROL

- A. The Engineer will inspect open cuts and trenches before installation of utilities, and will make the following tests:
 - 1. Assure the trenches are not backfilled until all tests have been completed.
 - 2. Check backfilling for proper layer thickness and compaction.
 - 3. Verify that test results conform to the specified requirements, and that sufficient tests are performed.
 - 4. Assure that defective work is removed and properly replaced.

3.03 CLEAN UP/ACCEPTANCE

- A. Protect newly graded areas from traffic and erosion, and keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded and rutted areas to the specified tolerances.
- C. Keep all travel routes free of tracked or spilled materials.

END OF SECTION

DIVISION 32

**EXTERIOR
IMPROVEMENTS**

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Division 00 – Procurement and Contracting Requirements and all provisions of Division 01 - General Requirements, apply to this Section.
- B. Section Includes:
 - 1. Fence fabric, posts and related items
 - 2. Excavation for fence posts
 - 3. Gates and related hardware

1.02 SUBMITTALS

- A. Product Data: Required. Include material descriptions, dimensions of individual components and profiles, and finishes for chain link fences and gates.
- B. Shop Drawings Required:
 - 1. Indicate plan layout, spacing of components, accessories, filaments, and anchorage.
 - 2. Submit manufacturer's installation instructions and procedures, including standard details of fence and gate installation.
- C. Samples: Required, see Item 2.02 MATERIALS for selection
 - 1. Fabric colors for selection or approval of Architect.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. A90/A90M, *Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc Alloy Coatings*
 - 2. A 370, *Mechanical Testing of Steel Products*
 - 3. A 392, *Zinc-Coated Steel Chain Link Fence Fabric*
 - 4. F 668, *Polyvinyl Chloride (PVC)-Coated Steel Chain Link Fence Fabric*
 - 5. F 934, *Standard Colors for Polymer Coated Chain Link Fence Materials*
 - 6. F 1043, *Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework*
 - 7. F 1664, *Standard Specification for Polyvinyl Chloride(PVC)-Coated Steel Tension Wire Used with Chain Link-Fence*

- B. Chain Link Fence Manufacturers Institute (CLFMI)

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable manufacturers, subject to compliance with Project requirements:
Master Halco, Inc., Richard's Fence, General Wire and Supply Co., or approved equal.

2.02 MATERIALS

- A. Polyvinyl Chloride (PVC)-Coated Steel Chain Link Fence System:
1. Height: As indicated on drawings.
 2. Fabric: 2" mesh, 9 ga. wire, with turn down knuckled and knubled
 3. Top Rail: 1-5/8" O.D. pipe
 4. Bottom Tension Wire: 7 ga.
 5. Line Posts: 2" O.D. pipe, Schedule 40
 6. End, Corner, Gate, and Pull Posts: 3" O.D. pipe, Schedule 40
 7. Finish:
 - a. Fabric: 2.0 oz. zinc coated as per ASTM A 392 or if noted on the drawings, 6 ga. bonded PVC coating in color as selected by the Architect, if not indicated on the drawings.
 - b. All other components: Finished to match fabric
 8. Gates: Frame 2" O.D. pipe welded at corners. Gate shall have a positive, automatic type latching device operative from both sides of gate with provision for padlocking.
 - a. Padlock: N.I.C.
 - b. Hinges sized to gate size and shall permit 180° swing.
 - c. Vehicle gates shall have automatic keepers which engage each gate leaf and holds it until manually released.
 9. Provide all accessories and hardware required for a complete installation.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Each post shall be anchored as indicated on drawings.
- B. Line posts shall be maximum 10 feet on center.
- C. Provide large gate swing posts as per standards for all gates over 7' - 0" in width.

- D. Top rails shall pass through intermediate post tops and form a continuous brace within each stretch of fence and be securely fastened to terminal posts.
 - 1. Pipe posts shall have tops that exclude moisture.
- E. End, corner, pull and gate posts shall be braced with the same material as the top rail and trussed to line posts with 3/8" rods and tighteners.
- F. Fabric shall be connected:
 - 1. To line posts every 14"
 - 2. To top rail every 24"
 - 3. To end, corner and gate posts by using tension bars connected to the post every 14" with steel bands with bolts and nuts
 - 4. To tension wire with hog rings every 24"

3.02 CLEAN UP/ACCEPTANCE

- A. Adjust gate and hardware to operate freely and properly.

END OF SECTION

SECTION 32 31 19

DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Division 00 – Procurement and Contracting Requirements and all provisions of Division 01 - General Requirements, apply to this Section.
- B. Section Includes:
 - 1. Metal fence pickets, rails, posts, and related accessories
 - 2. Finishing for metal fencing and gates
 - 3. Gates and related hardware

1.02 SUBMITTALS

- A. Product Data: Required. Include material descriptions, dimensions of individual components, and finishes for metal fence and gate(s).
- B. Shop Drawings Required:
 - 1. Indicate plan layout, spacing of components, accessories, and anchorage.
 - 2. Provide complete detailing of fabrication and installation including all anchorage and accessory items. Provide required templates for anchors and bolts specified for installation under other sections.
 - 3. Where metal fencing and gates are specified or required by code to comply with design loading, the shop drawings and structural calculations necessary shall be certified by a Licensed Professional Engineer.
- C. Finishing:
 - 1. Product Data: Manufacturer's data sheets on each paint and coating product, including the following:
 - a. Product characteristics
 - b. Surface preparation instructions and recommendations
 - c. Primer requirements and finish specification
 - d. Storage and handling requirements and recommendations
 - e. Application methods
 - f. Cautions, VOC's
 - 2. Color, if not indicated on the Drawings, will be selected by the Architect and submitted to the Contractor in scheduled form.

1.03 REFERENCES

- A. American Welding Society (AWS): *Structural Welding Code*
- B. ASTM International (ASTM):
 - 1. ASTM A36, *Standard Specification for Carbon Structural Steel*
 - 2. ASTM A47, *Standard Specification for Ferritic Malleable Iron Castings*
 - 3. ASTM A53, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*
 - 4. ASTM A123, *Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products*
 - 5. ASTM A153, *Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*
 - 6. ASTM A385, *Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)*
 - 7. ASTM A500, *Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes*
 - 8. ASTM A992, *Standard Specification for Structural Steel Shapes*

1.04 SYSTEM DESCRIPTION

- A. Structural Requirements: Design, engineer, fabricate and install metal fencing and gates to withstand acceptable standard, code required and/or prescribed structural loads without exceeding the allowable working stress of materials involved, anchors and connections. Apply each loading to each member to produce maximum stress in each fabrication component. Provide Certified Licensed Engineer (licensed by the State authorities where the project is located) Calculations and data, if requested.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide new metal, of the best commercial quality for the purpose intended, free from defects impairing strength, durability and appearance. Conform to the following standards for miscellaneous structural steel framing and miscellaneous non-structural steel:
 - 1. Structural Tube Columns: ASTM A500, Grade B
 - 2. Pipe: ASTM A53, Type S, Grade B
 - 3. Other Structural Steel: ASTM A36
 - 4. Malleable Iron Castings: ASTM A47
 - 5. Fasteners: Bolts, nuts, washers and other fasteners shall conform to the appropriate Federal Specifications.
- B. Gates: Gate shall have a positive, automatic type latching device operative from both sides of gate with provision for padlocking.
 - 1. Padlock: N.I.C.
 - 2. Hinges shall be gravity hinges sized to gate size and shall permit 180° swing.

- C. Miscellaneous Materials:
 - 1. Cold Galvanizing: Welco Cold Galvanizing, by Welco.
 - 2. Non-shrink Grout: Euco N-S Grout, by Euclid.
- D. Provide all accessories and hardware required for a complete installation.
- E. Finishing: Product names and numbers identified below reference Sherwin Williams (S-W) products. Other acceptable paint manufacturers, subject to compliance with the Project requirements, include: Pratt & Lambert, Benjamin Moore, Devco, PPG, Mautz, Hirshfield, or approved equal. Colors and finish as selected by Architect, if not indicated on the Drawings.
 - 1. Metal- Ferrous or Galvanized: High Gloss Latex Enamel
 - a. Touch up - S-W DTM Acrylic Primer/Finish
 - b. 2 Coats – S-W SuperPaint Exterior High Gloss Latex Enamel, A85 Series

PART 3 EXECUTION

3.01 INSTALLATION

- A. Space posts uniformly unless otherwise indicated.
- B. Posts shall be surface mounted as indicated on drawings.
- C. Check each post for vertical and top alignment, and maintain in position during placement and finishing operation.
- D. Install gates, if/where required, plumb, level, and secure for full opening without interference.

3.02 FINISHING

- A. Workmanship: Workmanship shall be of the very best. All materials evenly spread and smoothly flowed on, giving a uniform sheen and color without runs and sags. Transparent finishes shall have all coats brushed out smooth. Only skilled mechanics shall be employed and all materials shall be applied in strict accordance with manufacturer's directions. Except as otherwise specified, only one manufacturer's materials shall be used in each of the finishes specified
- B. Application:
 - 1. Apply all coatings and materials according to the manufacturer's printed recommendations.
 - 2. Do not apply to wet or damp surfaces.

3. Do no exterior painting below 50° F temperature.
4. Paint all exposed surfaces of every member. Paint anything inaccessible after installation before installation, if required to be painted.
 - a. Apply coatings using methods recommended by manufacturer.
 - b. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.
 - c. Apply coatings at spreading rate required to achieve the manufacturer's recommended dry film thickness.
5. Apply all coatings without reduction except as specifically required by label directions, or required by this specification. In such cases, reduction shall be the minimum permitted.
6. Thoroughly cover with uniform color and finish, as necessary for a complete hide, the number of coats specified being a minimum. Undercoats shall be colored to approximately match the final color.

3.03 CLEAN UP/ACCEPTANCE

- A. Clean up debris and unused material, and remove from site.
- B. Final Touch-up:
 1. Where coverage is incomplete or not uniform, as determined by the Architect, provide additional coats at no additional cost to the Owner.
 2. Touch-up damaged coatings after Substantial Completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

END OF SECTION

SECTION 32 31 29

WOOD FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Division 00 – Procurement and Contracting Requirements and all provisions of Division 01 - General Requirements, apply to this Section.
- B. Section Includes:
 - 1. Wood fence pickets, rails, posts and related accessories
 - 2. Excavation for fence posts
 - 3. Gates and related hardware
- C. Related Sections
 - 1. Section 03 30 00 – Cast-In-Place Concrete: Concrete fill for post holes

1.02 SUBMITTALS

- A. Product Data: Required. Include material descriptions and dimensions of individual components for wood fences.
- B. Shop Drawings Required:
 - 1. Indicate plan layout, spacing of components, accessories, and anchorage.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Western Red Cedar Fence System:
 - 1. Height: As indicated on drawings.
 - 2. Slats: Dog-eared slats, Shadow-box construction
 - 3. Top, bottom, and intermediate rails: 2x4 cedar
 - 4. Corner, gate, end, and/or line posts: 4x4 cedar
 - 5. Gates: Gate shall have a positive, automatic type latching device operative from both sides of gate with provision for padlocking.
 - a. Padlock: N.I.C.
 - b. Hinges sized to gate size and shall permit 180° swing.
 - 6. Provide all accessories and hardware required for a complete installation.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Space posts uniformly at 8'-0" o.c. unless otherwise indicated.
- B. Concrete set posts: Drill hole in firm, undisturbed or compacted soil. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post depth as indicated on drawings. Place concrete around post in a continuous pour. Trowel finish around posts and slope to direct water away from posts.
- C. Check each post for vertical and top alignment, and maintain in position during placement and finishing operation.
- D. Install gates, if/where required, plumb, level, and secure for full opening without interference.

3.02 CLEAN UP/ACCEPTANCE

- A. Clean up debris and unused material, and remove from site.

END OF SECTION

SECTION 32 90 00

PLANTING, TURF, AND GRASSES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of English Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Lawn - sodden and/or seeding:
 - a. Restore all lawns damaged as a result of completing the construction of this project, including at edges of paved areas.
 - 2. Plantings as per schedule on drawings.
 - a. Layout as per site plan.
 - 3. Bark mulch
 - 4. Rock Mulch
 - 5. Fabric liner
 - 6. Metal edging
 - 7. Excavation for trees and/or plants.
 - 8. Additional topsoil and placing of same for trees and/or plants.

1.02 WARRANTIES, GUARANTEES

- A. Guarantee: All plantings and seeding shall be guaranteed for one year (365 days) from acceptance of project by Owner. Replacement:
 - 1. Remove and replace any plant or seeding (as noted above) that is found dead or not in satisfactory growth.
 - 2. Replacement plants shall be same kind and size as specified for original plants.
 - 3. Cost of replacements shall be at expense of Contractor, except replacement required due to loss or damage due to occupancy of the project, vandalism or acts of neglect on the part of others during the guarantee period, after acceptance. Replacement plants shall be further guaranteed for another year from replacement.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil: Natural, friable, fertile, native peat loam possessing the characteristics of representative topsoil in the vicinity which produces heavy growths of vegetation.
 - 1. Topsoil shall be free from subsoil, noxious weeds, sticks, roots, stones, lime, concrete, ashes, slag or other deleterious matter, and shall be well drained in its original condition and free of toxic quantities of acid or alkaline elements.
 - 2. Contractor to add topsoil to areas receiving seeding as necessary.

- B. Sod: 1 ½" thick free from stones, dandelions, crab grass and weeds. Height of grass when sod is obtained shall not exceed 3". No peat grown sod permitted.
- C. Plant Material:
1. Names and Grades: Plant material shall conform to nomenclature of "Standardized Plant Names" as adopted by the Joint Committee of Horticulture Nomenclature, latest edition. Size and grading standards shall conform to the American Association of Nurserymen, Inc., as published in *American Standard for Nursery Stocks* latest edition. No substitutions of size or grade shall be permitted without written permission of the Engineer. Each bundle of plants and all separate plants, shall be properly identified with legible waterproof tag securely fastened to each plant or bundle of plants.
 2. Plant Schedule: See drawings. The height and caliper of the trees, the height or spread of shrubs, the diameter of the balls of roots are the minimum dimensions required. Plants indicated "B&B" are to be dug with a ball of earth and wrapped in burlap.
 3. Form: Well formed for the species or variety. Trees shall have single trunks, unless clump form is specified. Crotches shall be sound and unsplit.
 4. Digging and Handling: All precautions customary in good trade practice shall be taken in preparing plants for transplanting, in accordance with the *American Standard for Nursery Stock*, latest edition. Workmanship that fails to meet the highest standards will be rejected.
 5. Health: All plants including their roots shall be free from disease, insects or other injurious qualities. Contractor shall comply with all local, states, and federal laws pertaining to the inspection, sale, and shipment of plant materials. The trunk bark of all trees shall be sound. Trees shall have no large wound, and any small wound shall have a satisfactory callus roll formed or forming over them. Plants shall show good annual growth. Buds shall be plump and well filled for the species. Evergreen foliage shall be of good intense color. All plants shall be nursery grown except those trees and shrubs existing on the site that are transplantable. They shall have been growing in similar climatic conditions as the location of the project for at least two years prior to the date of this contract.
 6. Ball and Burlap: All balled and burlapped plants shall conform to the *American Standard for Nursery Stock* latest edition. All balls shall be of natural earth in which the plant has been growing. No manufactured or artificially produced or mudded-in balls shall be accepted. Balls shall be firm and unbroken and of large enough size to adequately enclose the plant's fibrous root system. Balled and burlapped plants may be rejected due to their failure to meet good digging practices.
- D. Water: Clean, free from deleterious substances.
- E. Grass Seed: Seed mix shall be for urban areas as specified in Article 2601.04, Paragraph C, of the Iowa DOT English Standard Specifications.

- F. Landscape Edging: All edging shall be 3/16" x 4" steel (Black) complete with anchor stakes.
- G. Bark Mulch: Commercially or locally processed cedar mulch, shavings, or ground bark free of growth or germination inhibiting ingredients. Mulch to be placed at a minimum of 4" depth.
- H. Rock Mulch: River rock shall be earth tones, minimum ¾" size. Place at a minimum depth of 3".
- I. Fabric Liner: Duon or equivalent landscape fabric.

PART 3 EXECUTION

3.01 INSTALLATION

- A. All planting shall be done in accordance with Section 2610 and articles of the Iowa DOT English Standard Specifications as stated below:
 - 1. Shrub Planting:
 - a. Layout: All shrubs shall be located as designated on the contract drawings and as directed by the Engineer. Where below ground or overhead obstructions are encountered, the shrubs shall be relocated as directed by Engineer.
 - b. Planting Pits: Shall be in accordance with Article 2610.03.
 - c. Setting of Shrubs: Shall be in accordance with Article 2610.03.
 - d. Pruning: Shall be in accordance with Article 2610.03.
 - e. Maintenance:
 - 1) The Contractor shall be required to make periodic checks on the total project to make certain that the materials are properly watered, cultivated, pruned and that all trees and evergreens are standing plumb, straightening those that are leaning, and that the sum of all conditions are contributing to the satisfactory progress of the materials, until such time as the work is approved by the Engineer and accepted by the Owner.
 - 2. Seeding:
 - a. Seed shall be applied to all disturbed areas not noted for sod, site improvements or landscaping.
 - b. Seeding shall be applied in accordance with Article 2601.04.
 - 3. Mulch Beds Over Liner:
 - a. Install edgings to locations shown on drawings to provide a uniformly level and in line edge.
 - b. All areas as shown on plans where seed or sod and mulch beds touch shall have steel edging installed.

- c. All planting beds or bufferstrips shall receive mulch over a liner unless indicated otherwise on plans. Place liner on subgrade at depth shown. Lap joints 2". If liner is non-perforated type, puncture at approximately 6" centers both directions, holes not to exceed 1/8" diameter.
 - d. Place mulch to uniform 4" depth for hardwood mulch and 3" for rock mulch if not otherwise indicated and flush with edging top.
- 4. Maintenance:
 - a. Commence immediately after each portion of lawn or planting is completed.
 - b. Maintain new plantings and water, mow and replant lawns to establish uniform turf until acceptance of project by Owner. Maintain watering for two weeks minimum regardless of project acceptance date.
 - c. Scattered bare spots in lawn no larger than 1 square foot each will be acceptable up to 3 percent of lawn area.
 - d. Repair any damage resulting from planting operations.

3.02 CLEAN-UP/ACCEPTANCE

- A. Protect/Clean
 - 1. Protect adjoining pavements, walks, structures from dirt and staining during completion of work. Cleaning of same is required.
 - 2. Leave site free of debris from this Section of Work.
 - 3. All ground areas disturbed as a result of planting operations shall be restored to their original condition or to the desired new appearance.
 - 4. Protect completed landscaping from any damage until project is accepted by Owner.

END OF SECTION

Introductory Information

**PROJECT MANUAL FOR:
CONTRACT 233AG
REST AREA STANDBY GENERATORS
IOWA COUNTY REST AREA
EAST BOUND AND WEST BOUND
PROJECT NO. IMN-80-6(2958)207--0E-48**

CERTIFICATION

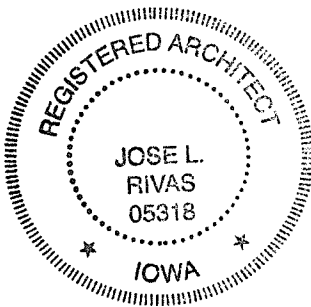
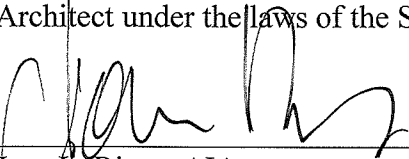
PROJECT

IDOT 233AG
Rest Area Standby Generators

ARCHITECT

Yaggy Colby Associates
Mason City, Iowa and
717 Third Avenue SE
Rochester, MN 55904



Telephone: (507) 288-6464
Fax: (507) 288-5058

<p>(SEAL)</p> 	<p>I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly registered Architect under the laws of the State of Iowa.</p> <p> <u>5/21/09</u> Jose L. Rivas, AIA (Date) License #05318</p> <p>My License renewal date is 06/30/11</p> <p>Pages or sheets covered by this seal: Division 03.</p>
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LANDSCAPE ARCHITECT

Yaggy Colby Associates
215 North Adams
Mason City, IA 50401

Telephone: (641) 424-6344
Fax (641) 424-0351

<p>(SEAL)</p> 	<p>I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly registered Landscape Architect under the laws of the State of Iowa.</p> <p> <u>5/21/09</u> Monte A. Appelgate, ASLA (Date) License #342</p> <p>My License renewal date is 06/30/10</p> <p>Pages or sheets covered by this seal: Division 32.</p>
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CIVIL ENGINEER

French-Reneker-Associates, Inc.
1501 South Main Street
Fairfield, IA 52556

Telephone: (641) 472-5145
Fax: (641) 472-2653

(SEAL)



I hereby certify that this engineering document was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Iowa.

David H. Fredericks 5/21/09
David H. Fredericks, PE (Date)
License #9336


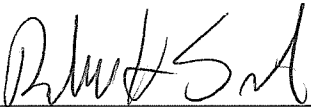
My License renewal date is 12/31/09

Pages or sheets covered by this seal: Divisions 02 and 31.

MECHANICAL/ELECTRICAL ENGINEER

Brown Engineering Company
5525 Meredith Drive, Suite D
Des Moines, IA 50310

Telephone: (515) 331-1325
Fax: (515) 331-1375

<p>(SEAL)</p> 	<p>I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.</p> <p> Robert H. Sieh, PE License #15377</p> <p>5-21-09 (Date)</p> <p>My license renewal date is 12/31/09</p> <p>Pages or sheets covered by this seal: Division 26.</p>
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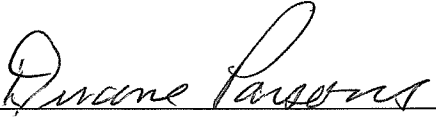
<p>(SEAL)</p> 	<p>I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.</p> <p> Duane P. Parson, PE License #10520</p> <p>5/21/09 (Date)</p> <p>My license renewal date is 12/31/09</p> <p>Pages or sheets covered by this seal: Division 23.</p>
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DIVISION 02

EXISTING CONDITIONS

SECTION 02 01 00

MAINTENANCE OF EXISTING CONDITIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Maintain operation of existing rest area facilities, sidewalks, and utility services.
 - 2. Contractor shall notify the Iowa DOT, Division of Maintenance Services, 24 hours (minimum) in advance of when he plans to be on-site and performing work.
- C. Related Sections of Work;
 - 1. Demolition: Section 02 41 00

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide all barricades, fences, and warning lights as required to protect persons and property in accordance with all applicable Iowa DOT specifications and regulations.

PART 3 EXECUTION

3.01 INSPECTION

- A. Locate existing utilities in areas of work before starting operations under this section. Use all means necessary to provide protection from damage during construction operations.
- B. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Engineer immediately for directions as to procedure. Cooperate with Owner and public and private utility companies in keeping services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

3.02 PROCEDURE

- A. Maintaining Traffic:
 - 1. Ensure minimum interference with roads, driveways, sidewalks, and adjacent facilities.

2. Do not close or obstruct roads, driveways, and sidewalks without permission from authorities having jurisdiction.
3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

B. Maintaining Utilities:

1. LP Gas Service and electrical service are essential to the operations of the rest area.
 - a. It will be necessary to shut down these services during construction. These shut downs shall be limited to two (2) hours per occurrence.
 - b. Contractor shall notify the Iowa DOT, Division of Maintenance Services, 48 hours (minimum) in advance of shutting down these services.

END OF SECTION

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Remove existing landscaping as indicated.
 - 2. Remove existing PCC sidewalk as indicated.
 - 3. Remove/abandon existing utilities as indicated.
- C. Related Sections and Work:
 - 1. Excavating, Stripping Topsoil, Filling, Grade: Division 31.
 - 2. Capping of Mechanical and Electrical Items: Divisions 23 and 26 – coordinate the proper local utility.

1.02 PROTECTION

- A. All remaining portions of property and utilities not scheduled for demolition shall be completely protected during demolition and removal of debris. Any resulting damage shall be repaired or replaced to like new condition by the Contractor responsible.

1.03 OCCUPANCY

- A. The rest area facilities shall remain open at all times.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide all barricades, fences, and warning lights as required to protect persons and property in accordance with all applicable Iowa DOT Specifications and regulations.

PART 3 EXECUTION

3.01 INSPECTION

- A. Prior to commencing the work installed under this section, examine the areas and conditions under which the work of this section will be performed. Notify the Engineer, in writing, of unacceptable conditions that exist, prior to acceptance.

3.02 CLEARING/PROCEDURE

- A. In all activities, comply with pertinent regulations of governmental agencies having jurisdictions.
- B. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- C. Demolition construction to be removed:
 - 1. Demolish completely and remove from the site.
 - 2. Use such methods as required to complete the work within the limitations of governing regulations.
 - 3. Break up and remove concrete slabs on grade as noted on drawings.
 - 4. Pollution Control:
 - a. Provide water sprinkling, temporary enclosures and other suitable methods as may be required to limit the amount of dust and dirt rising and scattering in the air to the lowest level of air pollution practical for the work conditions.
 - b. Comply with all governing regulations.
 - c. Clean adjacent structures and other improvements of all dust, dirt, and debris caused by demolition operations as directed by the Engineer.
 - d. Return all areas to conditions existing prior to start of the work of this section.
- D. Disposal of Materials:
 - 1. No demolition material is scheduled for reuse.
 - 2. All demolition material shall become property of the Contractor and shall be removed from the Owner's site by the Contractor. No prolonged accumulation of debris will be allowed.
 - a. Remove all demolition material from the site as removed. Storage or sale of removed items on the site will not be allowed.

3.03 CLEAN UP/ACCEPTANCE

- A. Clean up trash and debris caused by clearing operations under this section, keeping premises clean and neat at all times.

END OF SECTION

DIVISION 03

CONCRETE

SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Provide formwork for all cast-in-place concrete including formwork for concrete bases for equipment of mechanical and electrical divisions, if applicable. Contractors for Divisions 21, 22, 23, and 26 shall be responsible for size, location and required inserts.
 - 2. Install all inserts, sleeves, bolts and similar items required for the work of other sections.

1.02 RELATED SECTIONS AND WORK

- A. Furnishing of inserts, sleeves, bolts and similar items of other sections which are built into the work of this section.
- B. Exterior concrete pads for mechanical and electrical equipment: Respective Divisions 21, 22, 23, and 26.

1.03 QUALITY ASSURANCE

- A. American Concrete Institute (ACI)
 - 1. ACI 347, Recommended Practice for Concrete Formwork.
 - 2. ACI 301, Specifications for Structural Concrete for Buildings
 - a. Tolerances are not cumulative, 1/8" max.
 - 3. ACI 318 - Building Code requirements for Reinforced Concrete.
 - 4. PS 1 - Construction and Industrial Plywood.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Removable Forms:
 - 1. Forms for Exposed Finish Concrete: Unless otherwise shown or specified, construct formwork for concrete surfaces, which will be exposed to view in the completed project, with plastic coated plywood, metal, metal-framed plastic coated plywood or other acceptable panel-type materials, to provide continuous,

straight, smooth exposed surfaces. Furnish in largest practicable sizes to minimize number of joints.

- a. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
2. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed to view in the completed project with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
3. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces to be cured with water or curing compound.

B. Embedded Items, Accessories:

1. All anchor bolts, inserts, plates, angles, sleeves, nailing blocks, etc., whether furnished as specified under this division, or other divisions, furnished by other trades or by the Owner shall be installed by this Contractor. Anchor bolts, unless specifically furnished by others, will be furnished by this Contractor. Suitable templates will be constructed and used to accurately set and support against displacement all bolts, inserts, sleeves, etc.
2. Conduits and Pipes: This Contractor shall be responsible for controlling the proper placing of all embedded pipe, conduit and other fixtures. ACI 318, Article 6.3 shall apply to all cause of embedded fixtures.
3. Corner Formers: Provide 45 degrees corner formers (chamfer) on all exposed external corners and exposed edges in the final project.

C. Form Ties:

1. For unexposed concrete: Adjustable length removable or snap-off type which will leave holes no larger than 1" in diameter in face of concrete and when forms are removed no metal will be within 1" of finished concrete surface.
2. For exposed concrete:
 - a. Cone type, length and size required, with removable plastic cone, which when removed will leave clean, neat hole 1" dia. and approximately 1 1/2" deep.
3. No wire ties or site fabricated ties permitted.

PART 3 EXECUTION

3.01 INSTALLATION

A. Form Construction:

1. General: Construct forms complying with ACI 347, to the exact sizes, shapes, lines and dimensions shown and as required to obtain accurate alignment, location, grades, level and plumb work in the finished structures.
2. Design, engineering and proper construction of forms, shoring and bracing is the responsibility of the Contractor. Include all factors pertaining to safety of

formwork structure such as live load, dead load, weight of equipment on formwork, concrete mix, height of concrete drop, vibration reactions and similar factors.

3. Construct formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.
4. Construct formwork, brace, shore, tie forms to maintain position and shape true and straight without deflection.
5. Coat forms in accordance with manufacturer's recommendations to provide for removal of forms without damaging surface of finished concrete prior to placing reinforcement.
 - a. Do not coat construction joints.
 - b. Excess coating material shall not be allowed to stand in puddles in the forms nor allowed to come in contact with concrete against which fresh concrete will be placed.
 - c. Do not coat permanent forms.

B. Earth Forms:

1. Side forms for footings may be omitted and concrete may be placed directly against excavation, only when requested by the Contractor and approved in writing by the Engineer.
2. When omission of forms is accepted, provide additional concrete 1" on each side of the minimum design profiles and dimensions shown on the drawings.

C. Removal of Forms:

1. Remove forms in a manner and at such time to insure complete safety of the structure. In no case shall supporting forms or shoring be removed until sufficient strength has been obtained to support weight and load.
 - a. Results of job-cured cylinders (ASTM C 31) shall be used as evidence that concrete has obtained required strength.
2. Remove in manner that will not damage concrete or adversely affect appearance of exposed concrete members.
3. Coordinate removal with work of other trades.
4. Completely remove all wall ties, leaving clean cut holes without disfigurement of concrete.

D. Tolerances: Tolerances for construction of cast-in-place concrete work shall be as follows:

1. General: Tolerances of any kind permitted in construction shall not relieve the Contractor of providing the design indicated or fitting the different materials together properly for continuity of construction, proper function of building.
2. Footings:
 - a. Variation of dimensions in plan: +2", -1/2"
 - b. Variation of center from specified center in plan: 2 percent of footing width in direction of variation, plus or minus 2" maximum variation.
 - c. Variation of bearing surface from specified elevation: plus or minus 1/2".
3. Piers, Columns and Walls:

- a. Variation in cross-sectional dimensions of piers and columns and in thickness of walls: plus or minus 1/4".
- b. Variation in plan from specified location in plan: plus or minus 1/2" any member, any location.
- c. Deviation in plan from straight lines parallel to specified linear building lines.
 - 1) 1/40" per foot, adjacent members less than 20' apart or any wall length less than 20'.
 - 2) 1/2" adjacent members 20' or more apart or any wall length of 20'.
- d. Deviation from Plumb:
 - 1) 1/4" any 10' of height.
 - 2) 1" maximum for the entire height.
- e. Variation in elevation from specified elevation: plus or minus 1/2", any member, any location.
- f. Deviation in elevation from lines parallel to specified grade lines.
 - 1) 1/40" per foot, adjacent members less than 20' apart or any wall length less than 20'.
 - 2) 1/2" adjacent members 20' or more apart or any wall length of 20'.
- 4. Anchor Bolts and Sleeves:
 - a. Variation from specified location in plan: plus or minus 1/4".
 - b. Variation from specified elevation: plus or minus 1/2".
- 5. Deviation from Drainage (Pitch) Slope:
 - a. Tolerances of any kind permitted in construction shall not relieve the Contractor of providing uniform drainage pitch or slope (without areas that cause ponding) where indicated by note, elevation differences or design.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Fabrication and Placement of Reinforcement For:
 - a. Cast-In-Place Concrete
 - b. Structural Concrete
 - c. Including bars, welded wire fabric, ties, supports and accessories required.
 - 2. Furnishing bars for reinforced masonry.
 - 3. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site.
 - 4. Contractor is responsible for the fabrication processes, techniques of construction, coordination of his work with that of all other trades, and the satisfactory performance of his work.

1.02 QUALITY ASSURANCE

- A. American Concrete Institute (ACI)
 - 1. ACI 318, Building Code Requirements for Reinforced Concrete.
- B. Concrete Reinforcing Steel Institute (CRSI), American Society for Testing and Materials (ASTM), American Welding Society (AWS), American National Standards Institute (ANSI).
 - 1. Manual of Standard Practice
 - 2. ACI 301 - Structural Concrete for Buildings
 - 3. ACI SP-66 - American Concrete Institute - Detailing Manual
 - 4. ANSI/ASTM A 82 - Cold Drawn Steel Wire for Concrete Reinforcement
 - 5. ANSI/ASTM A 185 - Welded Steel Wire Fabric for Concrete Reinforcement
 - 6. ANSI/ASTM A 497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement
 - 7. ANSI/AWS D 1.4 - Structural Welding Code for Reinforcing Steel
 - 8. ASTM A 615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement
 - 9. ASTM A 706 - Low Alloy Steel Deformed Bars for Concrete Reinforcement
 - 10. AWS D 12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction
 - 11. CRSI - Placing Reinforcing Bars

1.03 SUBMITTALS

- A. Shop Drawings: If required by Engineer.
 - 1. Submit complete shop and setting drawings. Include reinforcing for all concrete and masonry work.
 - 2. Show reinforcing size, length, bending details, spacing, and methods of supporting reinforcing. Provide details as necessary to show final position of reinforcement in elements. Show all walls in plan and elevation.
 - 3. Engineer's review of shop drawings will be for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Compliance with the requirements for materials, dimensions, fabrication, and erection is the Contractor's responsibility.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver all bars to job site, bundled in manageable units and properly tagged to permit inspection identification.
- B. Do not exceed capacity of existing construction or formwork.
- C. Store reinforcing clear of ground and avoid contact with mud, grease, or other materials which would affect bond.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Reinforcing Steel:
 - 1. All Reinforcing Bars: ASTM A 615, Grade 60, deformed as per ASTM specifications.
 - 2. Welded Smooth Wire Fabric: ASTM A 185 welded steel wire fabric for concrete reinforcement, size as noted on drawings. Minimum 6" x 6": 1.4W x 1.4W Welded Wire Fabric.
 - 3. Dowels: Plain round rolled steel bars, ASTM A 306, Grade 80.
- B. Accessories:
 - 1. Chairs and spacers: Metal stock designed for purpose intended.
 - 2. Comply with CRSI "Recommended Practice for Placing Bar Supports, Specifications and Nomenclature".
 - 3. Provide galvanized or plastic tipped accessories in contact with forms for sight exposed concrete; stainless steel accessories for sandblasted or bush-hammered concrete.
 - 4. Wire: Plain, cold-drawn steel wire, ASTM A 82.

2.02 FABRICATION

- A. General: Fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI Manual of Standard Practice. In case of fabricating errors, do not rebend or straighten reinforcement in a manner that will injure or weaken the material.
- B. Unacceptable Materials: Reinforcement with any of the following defects will not be permitted in the work:
 - 1. Bar lengths, depths and bends exceeding specified fabrication tolerances.
 - 2. Bend or kinks not indicated on drawings or final shop drawings.
 - 3. Bars with reduced cross-section due to excessive rusting or other cause.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Comply with the specified codes and standards and Concrete Reinforcing Steel Institute recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified and noted on the structural drawings.
 - 1. Clean reinforcement to remove loose rust and mill scale, earth, ice and other materials which reduce or destroy bond with concrete. Metal reinforcement with rust, mill scale or a combination of both shall be considered as satisfactory, provided the minimum dimensions, including height or deformations and weight of hand wire brushed test specimen, are not less than the applicable ASTM specification requirement.
 - 2. Position, support and secure reinforcement against displacement by formwork, construction or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.
 - 3. All splicing of bars, concrete cover, placing tolerances and bar spacings shall conform to Building Code Requirements for Reinforced Concrete (ACI 318), as published by the American Concrete Institute and to recommended practices in Reinforcing Bar Splices by the Concrete Reinforcing Steel Institute. Splices not detailed require approval of the Engineer prior to placing concrete.
 - 4. Place reinforcement to obtain the minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports together with 16 gauge wire to hold reinforcements accurately in position during concrete placement operations. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.
 - a. Protect reinforcement by concrete as follows unless otherwise detailed:
 - (1) Where concrete is exposed to weather or to ground, but placed in forms: not less than 2" for bars more than 5/8" diameter and 1 1/2" for bars 5/8" or less in diameter.
 - 1) Concrete covering or reinforcing in footings: 3" clear on bottom and sides.

- (2) All other concrete: cover reinforcement a minimum of 3/4" for slabs and walls and 1 1/2" from floor penetrations and beam faces.
- 5. Coordinate and cooperate with other trades to insure that all reinforcing is in proper place and that all pipes, sleeves, conduit, anchors, bolts, flashings, caulking grooves, slips and other inserts of other trades to be cast into concrete are securely placed before concrete is placed.
- 6. Install welded wire fabric in as long lengths as practicable, cut to fit all penetrations. Lap wire mesh in structural slabs so that full, uncut squares of mesh of both sheets lap each other at least 1 1/2 times or 12", whichever is greater. Lap wire mesh in slabs on grade and topping slabs so that full, uncut squares of mesh of both sheets lap each other at least 1/2 times or 6", whichever is greater. Lap splices with 16 gauge wire or clip together with standard metal clips. Place mat flat, without roll or curling.
 - a. Unless otherwise indicated, reinforce all concrete floor slabs, precast plank topping, concrete decks on permanent forms, walks, drives and all exterior slabs on grade with 6" x 6": 1.4W x 1.4W welded wire fabric.
- 7. Provide sufficient numbers of supports and of strength to carry reinforcement. Do not place reinforcing bars more than 2" beyond the last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.
- 8. No bars shall be placed while concrete is being poured.
- 9. No bars shall be bent after being partially embedded in hardened concrete.
- 10. No welding of reinforcing steel shall be permitted without prior written authorization by the Engineer.
- 11. Provide concrete masonry walls with full height vertical reinforcing where noted on plans.
 - a. Provide the same vertical reinforcement at all door jambs, corners, control joints and each side of columns.

3.02 FIELD QUALITY CONTROL

- A. Notify Engineer when reinforcing is in place so that a review of reinforcement placement can be made prior to placement of concrete.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Provide all cast-in-place concrete including masonry fill, setting of fence posts, and like items.
 - 2. Install anchor bolt inserts and similar items furnished by other trades.
 - 3. Contractor for this section of work shall coordinate all phases of the concrete work to completion.

1.02 RELATED SECTIONS

- A. Section 03 10 00 – Concrete Forming and Accessories
- B. Section 03 20 00 – Concrete Reinforcing
- C. Furnishing of anchor bolts, inserts and similar items required by other trades.
- D. Exterior (exterior only), concrete bases for equipment of mechanical and electrical – Divisions 21, 22, 23, and 26.

1.03 QUALITY ASSURANCE

- A. Reference Standards for Design and Construction
 - 1. American Concrete Institute (ACI)
 - a. ACI 301, 84, Specifications for Structural Concrete for Buildings
 - b. ACI 304, Concrete Placement
 - c. ACI 305, Recommended Practice for Hot Weather Concreting
 - d. ACI 306, Recommended Practice for Cold Weather Concreting
 - e. ACI 318, Building Code Requirements for Reinforced Concrete
 - 2. American Society for Testing and Materials (ASTM)
 - a. ASTM C 31, Making and Curing Concrete Test Specimens in the Field
 - b. ASTM C 33, Standard Specification for Concrete Aggregates
 - c. ASTM C 94, Standard Specification for Ready-Mixed Concrete
 - d. ASTM C 143, Test Method for Slump of Portland Cement Concrete
 - e. ASTM C 150, Standard Specification for Portland Cement

- f. ASTM C 171, Standard Specification for Sheet Materials for Curing Concrete.
 - g. ASTM C 260, Standard Specification for Air-Entrained Admixtures for Concrete.
 - h. ASTM C 309, Standard Specification for Liquid Membrane-Forming Compound for Curing Concrete.
 - i. ASTM C 330, Standard Specification for Lightweight Aggregates for Structural Concrete
 - j. ASTM C 494, Standard Specification for Chemical Admixtures for Concrete.
 - k. ASTM C 979, Standard Specification for Pigments for Integrally Colored Concrete.
- B. Other portions of this Section 03 30 00 contain requirements and information related to ACI Standards and ASTM Standards; in case of conflict between these standards and this section, the requirements of this Section 03 30 00 shall govern.
- C. Testing:
 - 1. See Article 1106.02, Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation.
 - 2. The concrete furnished under this section of work shall be the strength as indicated in PART 3 - EXECUTION and the tests listed in PART 3 - FIELD QUALITY CONTROL are required. These tests will be provided by the Owner.

1.04 SUBMITTALS

- A. Comply with requirements of field quality control testing listed in PART 3 - EXECUTION.
- B. Concrete Mix Design:
 - 1. General Requirements: The Contractor, at his expense, shall employ the services of an independent testing laboratory to test the proposed aggregate and design concrete mixes for each type of concrete required.
 - a. Submittal and approval of mix design: Aggregate test reports and mix design shall be submitted to the Engineer and structural engineer in duplicate for approval at least 14 days prior to placing of concrete. No concrete will be allowed to be placed until the aggregate test reports have been reviewed and mix designs approved by the Engineer.
 - b. Testing of Aggregate: Each type of fine course aggregate to be used shall be completely tested in accordance with the requirements of ASTM C 33, latest edition, and these specifications. Lightweight aggregate shall be tested in accordance with the requirements of ASTM C 330, latest edition.
 - c. Use of reports from other projects: Reports of tests made for other projects may be submitted; however, such tests shall be representative of

the aggregate to be furnished. If reports of tests made for other projects are submitted, the Contractor shall submit samples of each type of aggregate to be used to the laboratory and the following additional tests shall be made.

- 1) Gradation ASTM C 136-71 and C 117-69
 - 2) Organic Impurities ASTM C 40-73
 - 3) Friable Particles ASTM C 142-71
 - 4) Coal and Lignite ASTM C 123-69
- d. Submittal of Cement Samples: The Contractor shall also submit representative samples of each type of Portland Cement to the laboratory for use in preparation of mix designs.
- e. Design of Mixes: Design of mixes in accordance with ACI 301, Section 3.9. Base design on size of mixer, cement and aggregate to be used. Indicate cement factor, water-cement ratio and scale setting for mixer.
- f. Change of Aggregate: The approved mix design shall be used as long as aggregate characteristics remain unchanged. Upon significant changes in aggregate, prepare new mix designs.

1.05 WEATHER CONDITIONS

- A. Provide adequate protection against rain, sleet and snow before and during placement and finishing of concrete.
- B. Provide adequate protective measures to maintain the temperature of the concrete as specified.
- C. Keep a thermometer on the job site at all times to record temperature.
- D. At the time the concrete is poured the temperature of the forms and reinforcing steel shall not exceed the maximum or minimum temperatures specified for the concrete by more than 10° F.
- E. Use accelerating or retarding admixtures only in accord with recommendations of the testing laboratory and as approved by the Engineer.
- F. Do not allow CO₂ gases to contact freshly placed concrete. Repair or replace carbonized surfaces as directed by the Engineer.
- G. Cold Weather Concreting:
 - 1. Perform all cold weather concreting in accord with ACI 305 - "Recommended Practice for Cold Weather Concreting".
 - 2. Do not place concrete when the atmospheric temperature is below 40° F, or when the concrete is likely to be subjected to freezing temperatures within 24 hours after it has been deposited, unless adequate temporary

heating is provided. In no case shall concrete be exposed to freezing temperatures for 72 hours after placing.

3. Maintain concrete temperature not less than 50° F nor more than 90° F for the first three days after placing. Protect from freezing for the next five days.

H. Hot Weather Protection:

1. Perform all hot weather concreting in accord with ACI - 605 - "Recommended Practice for Hot Weather Concreting".
2. Thorough wet dry porous surfaces before concreting.
3. Maintain concrete temperature not less than 50° F no more than 90° F for the first three days after placing. Protect from temperatures over 90° F for the next five days.

PART 2 PRODUCTS

2.01 MATERIALS

A. All Concrete Materials shall be from Iowa Department of Transportation approved sources:

1. Portland Cement: ASTM C 150, Type 1
2. Aggregate:
 - a. Applicable Standard: ASTM C 33
 - b. Aggregate shall be hard-coated gravel or crushed stone, maximum size 1/5 narrowest dimension between reinforcing rods. Sizes as follows:
 - 1) Footing: 1 1/2" maximum
 - 2) Fill for masonry: 3/8" maximum
 - 3) All other concrete: 3/4" maximum
 - c. Sand: ASTM C 33, clean, hard uncoated grain, free from loam, clay and silt.
3. Water: Clean, potable and free of deleterious amounts of acids, alkalis and organic materials.

2.02 CONCRETE ADMIXTURES

A. All Concrete Admixtures shall be Iowa Department of Transportation approved sources.

B. Air Entraining Admixtures: Use in all concrete exposed to the weather and as specified for quality of concrete used, ASTM C 260.

1. "Aerolith", Sonneborn Building Products, Inc.
2. "Sika-AEA", Sika Chemical Corp.
3. "Darex AEA", W. R. Grace and Company
4. Engineer approved equivalent

- C. Water Reducing Admixture: ASTM C 494, Type A, and not containing more chloride ions than municipal drinking water. Acceptable manufacturers:
 - 1. Euclid Chemical Company - Eucon WR-75
 - 2. Sika Chemical Corp. - Plastocrete 160
 - 3. Master Builders - Pozzoloth 200N
 - 4. Engineer approved equivalent
- D. Non-Chloride Accelerators: ASTM C 494, Type C or Type E, and not containing more chloride ions than municipal drinking water. Acceptable manufacturers:
 - 1. Sika Chemical Corp. - Sikacrete
 - 2. W. R. Grace - Darex Set Accelerator
 - 3. Master Builders - Pozzoloth 122-HE
 - 4. Engineer approved equivalent.
- E. Calcium chloride is prohibited
- F. Fly Ash: ASTM C 618 at Contractor's option

2.03 MISCELLANEOUS MATERIALS

- A. Liquid Curing and Sealing Compound: Acrylic base, ASTM C 309, Type I, containing a minimum of 18% solids.
 - 1. Performance Requirements:
 - a. Contains no wax, oils, salts or other ingredient that is detrimental to bonding concrete topping, sealants, resilient tile, paint or other specified finish being applied to concrete.
 - b. Contains no ingredient which stains or discolors concrete permanently.
 - 2. Acceptable Manufacturers:
 - a. Euclid Chemical Company - Rezseal
 - b. Sonneborn - Kur-N-Seal
 - c. Tamms Industries Co. - SC Seal Cure 18
 - d. Engineer approved equivalent
- B. Bonding Compound: Polyvinyl acetate, rewettable type.
 - 1. Acceptable manufacturers:
 - a. Euclid Chemical Company - Euco Weld
 - b. Tamms Industries Co. - Lab Liquid Adhesive Bond
 - c. L&M Construction Chemicals - Everweld
 - d. Engineer approved equivalent
- C. Expansion joint filler: Performed, resilient, non-extruding asphalt impregnated cane fiber conforming to ASTM D 1751, Exterior Use ASTM D 1752, Federal Specifications HH-F-341E, Type 1.

1. Size:
 - a. Use 1/4" thick x depth of slab for all interior slabs on grade (not exposed to the elements.)
 - b. Use 1/2" thick unless shown otherwise x depth of slab.
- D. Patching Concrete: Same materials and proportions as the concrete used except.
 1. Omit coarse aggregate.
 2. Use no more than one part cement to 2-1/2 parts sand by damp, loose volume.

2.04 FABRICATION

- A. Concrete Type and Strength: Concrete shall have a minimum compressive strength, in place, at 28-days as follows:
 1. Exterior concrete slabs on grade, footings, foundation walls, and retaining walls: 4,000 psi with entrained air.
 2. Masonry Fill/Grout: 2,000 psi
 3. Masonry Bond Beams: 3,000 psi
 4. All other Concrete: 3,000 psi
- B. Slump: Concrete slump be as determined by ASTM C 143 and shall be as follows:
 1. Slabs-on-Grade Foundation walls and retaining walls: 3" maximum.
 2. Footings: 3" to 4"
 3. Masonry fill/grout for reinforced cores and piers: 5" to 8"
- C. Water-Cement Ratio: All exterior concrete exposed to weather shall have a water-cement ratio of not more than 0.44. All other concrete shall have a maximum ratio of 0.53.
- D. High-Early Strength Concrete: Contractor may use Type III Portland Cement to produce high-early strength concrete. Adding additional amounts of Type I Portland Cement to product high-early strength concrete will not be permitted.
- E. Brand of Cement: Only one brand of Portland Cement shall be used. The same brand and type, normal or high-early strength, of Portland Cement shall be used for all concrete to have an architectural finish.
- F. Workability: Concrete consistency shall be such that concrete will fill forms without voids or honeycombs, completely embed and bond to reinforcing without permitting materials to separate, and not promote excess water to collect on surface.

G. Admixtures:

1. Entrained air: All exterior concrete exposed to weather shall be air-entrained. Proportions of entrained air, as determined by ASTM C 138, ASTM C 173 or ASTM C 231, shall be 5-7 percent by volume for concrete with 3/4" maximum nominal size coarse aggregate.
2. Water Reducing Admixture: Provide in all concrete.
3. Non-Corrosive Accelerator: Provide in concrete slabs placed when below 50° F.
4. Calcium Chloride: Not permitted
5. Fly Ash: ASTM C 618, Type C, Contractor's option per mix design. Not to exceed 15% by weight substitution for Portland Cement.

H. Concrete Mixing:

1. General: All concrete required shall be ready-mix concrete and shall be provided by an Iowa Department of Transportation approved ready-mix concrete facility.
2. Ready-Mixed Concrete:
 - a. Applicable Standard: Concrete shall be mixed and delivered in accordance with ASTM C 94.
 - b. Source: Source of ready-mix concrete shall be approved by Engineer.
 - c. Agitating: Agitate concrete materials continuously from time materials are placed in mixer until concrete is discharged.
 - d. Tempering: No additional water shall be added to mix after truck leaves batching plant without approval of Engineer.
 - e. Departure Certification: Each truck shall have time of departure from batching plant stamped on ticket.
 - f. Delivery Time: There shall be a maximum of 1-1/2 hours between time concrete mix is placed in truck and placing of concrete in forms. When air temperature is between 85° F and 90° F, maximum delivery time shall be 75 minutes. When air temperature is above 90° F, maximum delivery time shall be 60 minutes.

PART 3 EXECUTION

3.01 INSTALLATION

A. Preparation before Placing Concrete:

1. General: Before concrete placement, formwork shall be completed, elevations verified, slope or drainage verified, snow, ice and water and other debris shall be removed, reinforcement shall be secured in place, and expansion joint materials shall be positioned.
 - a. Preparation of Subgrades: Sprinkle semi-porous subgrades sufficiently to eliminate suction. Do not place concrete on frozen ground, on soft mud, or dry porous earth.

2. Cleaning Equipment: Remove hardened concrete and foreign materials from inner surface of conveying equipment.
 3. Verify completion of all other work to be covered or enclosed by the concrete.
- B. General:
1. Conveying Concrete: Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.
 2. In joining fresh concrete to concrete that has already set, remove all loose and foreign materials from set concrete. Scrub with wire brooms and thoroughly clean. Moisturize when the new concrete is placed.
 3. Exercise care in placement of concrete for slabs on grade over vapor barrier. Avoid puncturing or tearing vapor barrier during transportation and placement.
- C. Placing Concrete:
1. Placing Exterior Slabs and Sidewalks:
 - a. Shelter Slabs Subgrade: Place shelter slabs on a minimum 12" thick compacted granular fill.
 - b. Thickness and reinforcing as shown on drawings.
 - 1) Minimum concrete (slab) thickness 6".
 - 2) Minimum reinforcing as indicated on Drawings.
 - c. Finish: Broomed finish unless otherwise indicated. After floating, troweling and when water sheen has disappeared, brush lightly with approved steel or fiber broom, to a uniform roughened surface. Brooming shall be at right angle to the centerline of walks and always in one direction of large continuous areas.
 - d. Expansion Joints: 1/2" pre-molded bituminous filler in locations detailed and at intervals not exceeding 30' in any direction.
 - e. Slope: Slope all exterior concrete slabs in a manner to prevent the collection of water.
 - f. Construction of Portland Cement Concrete sidewalks shall conform to Section 2511 of the Iowa DOT Standard Specifications.
 - g. Concrete shall be Class C concrete produced and placed in accordance with Section 2301 and Article 4115.04, Paragraph C, Iowa DOT Standard Specifications.
 - h. Course aggregate shall be Class 3i Durability.

- D. Consolidated Concrete:
1. General: Consolidate concrete by vibrating, spading, rodding or forking so that concrete is thoroughly worked around reinforcement, around embedded items, and into corners of forms to eliminate air or stone pockets which may cause honeycombing, pitting or planes of weakness. Use competent workmen under competent supervisors.
- E. Joints in Concrete:
1. Locate construction joints as indicated on drawings, or as approved by the Engineer.
 - a. Place joints perpendicular to the main reinforcement.
 - b. Refer to drawings for control and construction joints
 2. Expansion Joints: Refer to drawings and/or install whenever slabs abut vertical surfaces ACI 301.
 3. Contraction Joints: Refer to drawings for details and spacing notes.
- F. Pipe Sleeves and Embedded Items:
1. Before pouring any concrete, determine that all embedded metal pipe sleeves, anchors, anchor slots, anchor bolts, hangers, concrete inserts, and similar items are firmly secured and fastened in place and that all embedded items required of other divisions have been furnished and installed.
- G. Repairing and Patching: Remove and replace at no additional cost any concrete not formed as shown on plans, concrete out of alignment, surfaces beyond required tolerances or defective surfaces which cannot be properly repaired or patched, including any concrete failing to meet the strength requirements as determined by the testing laboratory.

3.02 CURING

- A. Protect concrete from premature drying. Provide temporary housing, covering, or other protection used in curing and keep in place and intact a minimum of 24 hours after artificial heating or cooling has been discontinued. Follow finishing operations with curing measures within two hours.
- B. Keep concrete continuously moist for 7 days. Prevent rapid drying at the end of the curing period. Accomplish cure by one of the following methods:
1. Ponding or continuous sprinkling.
 2. Absorptive mats or fabrics kept continuously wet.
 3. Non-staining waterproof paper as specified. Keep all joints airtight and weighted in place.
 4. Non-staining polyethylene film as specified. Keep all joints weighted to prevent wind penetration.

3.03 FIELD QUALITY CONTROL

- A. Comply with pertinent provisions of Article 1106.02, Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation.
- B. Work installed under this section shall be performed under the supervision of a capable foreman, in conformance with the standards referenced above.
- C. Testing: Owner will hire a Testing Agency to perform the following tests:
 - 1. Slump Tests:
 - a. Test Procedure: Maintain a slump cone on job during all concreting operations. Conduct slump tests in accordance with ASTM C 143.
 - 2. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one test for each set of compression test specimens.
 - 3. Compression Tests of Concrete Cylinders:
 - a. Cost Responsibility for Tests: Owner will have concrete test cylinders tested by a testing laboratory supervised by a professional Engineer licensed in the state of Iowa, and shall pay all costs of taking samples and performing the tests. Test cylinders shall be made in accordance with the "Standard Method of Making and Curing Concrete Compression and Flexure Test Specimens in The field" (ASTM C 31.) for compliance with specified strength.
 - b. Frequency of Testing: Take two sets of three test cylinders for every concrete placement and not less than two sets of three test cylinders for each additional 50 cubic yards of concrete placed. The first set of cylinders shall be considered control cylinders and shall be laboratory cured at 70° F. Of the control set, one cylinder shall be tested at 7 days, one at 28 days, and the third cylinder shall be tested only if 28-day cylinder failed. The second set of cylinders shall be job cured and used to determine when forms and shoring may be removed. The first of these cylinders shall be tested at 7 days and the other two cylinders tested only if required.
 - c. Number of Tests Per Set: Each set of test cylinder shall consist of three concrete test cylinders, 6" x 12" and each set shall be considered as one test. All cylinders in each set shall be taken from the same batch of concrete. Contractor shall note date, location and concrete slump on each cylinder made.
 - d. Location of Making Cylinders: Concrete test cylinders shall be made at discharge end of chute, slide or pipe and not at truck or mixer.
 - e. Strength Requirements: The strength level of the concrete will be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength f'_c and no individual strength test result falls below the specified strength f'_c by more than 500 psi.

- f. Compression Test Failure: Failure of concrete compression tests to meet specified strength will require a load test or test cores at Contractor's expense. Failure to meet required live and dead loads or meet strength requirements of cores shall constitute rejection or consideration for rejection by the ENGINEER. Cost of measures to make work satisfactory shall be paid by Contractor.
- 4. Reports:
 - a. Submit test result reports to Engineer.

END OF SECTION

DIVISION 23

HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

SECTION 23 00 00
HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Furnish all labor, materials, tools, equipment, scaffolding, transportation, permits, inspection certificates and temporary protection necessary to complete installation of all work as shown on Project Drawings and/or called for in these specifications. Drawings and specifications shall be considered mutually coordinate, and any material included in one but not the other shall be furnished as though required in both. All material necessary to provide a complete working installation shall be furnished whether mentioned or not.
- B. Before turning equipment over to the Owner, the Contractor shall thoroughly test equipment and instruct the Owner or his representative in its operations and maintenance.

1.02 CODES AND STANDARDS

- A. Comply with the latest applicable codes and standards as set forth by the following:

AGA	American Gas Association
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute, Inc.
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
DNR	Department of Natural Resources, State of Iowa
EPA	U.S. Environmental Protection Agency
MCA	Mechanical Contractors Association
MSS	Manufactures Standardization Society
NADCA	National Air Duct Cleaners Association
NBS	National Bureau of Standards
OSHA	Occupational Safety and Health Act
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
	State and Local Codes and Ordinances

- B. If there is a discrepancy between the codes and regulations having jurisdiction over this installation and these specifications, the Engineer shall determine the method or equipment used.
- C. If the Contractor notes, at the time of bidding, any parts of the drawings and specifications which are not in accordance with applicable codes or regulations, he shall inform the Engineer in writing, requesting a clarification. If there is insufficient time to follow this procedure, he shall submit with his proposal a separate price required to make the system shown on the drawings comply with the codes and regulations.
- D. All changes to the system made after the letting of the contract, in order to comply with the applicable codes or the requirements of the Inspector, shall be made by the Contractor without cost to the Owner.

- E. If there is a discrepancy between the manufacturer's recommendations and these specifications, the manufacturer's recommendations shall determine the method or equipment used.

1.03 PERMITS, FEES, TAXES, INSPECTIONS

- A. Procure all applicable permits and licenses.
- B. Abide by all applicable laws, regulations, ordinances, and other rules of the State or Political Subdivision wherein the work is done, or as required by any duly constituted public authority.
- C. Pay all applicable charges for such permits or licenses that may be required.
- D. Pay all applicable fees and taxes imposed by the State, Municipal and/or other regulatory bodies.
- E. Pay all charges arising out of required inspections by the codes, permits, licenses or as otherwise may be required by an authorized body.

1.04 EXAMINATION OF DRAWINGS

- A. The drawings for the mechanical work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
- B. Contractor shall determine the exact locations of the equipment and rough-ins, and the exact routing of pipes and ducts so as to best fit the layout of the job.
- C. Scaling of the drawings will not be sufficient or accurate for determine these locations.
- D. Where job conditions require reasonable changes in indicated arrangements/locations, such changes shall be made by the Contractor at no additional cost to the Owner.
- E. Because of the scale of the drawings, certain basic items, such as fittings, boxes, valves, unions, etc., may not be shown, but where such items are required by other sections of the specifications or where they are required for proper installation of the work, such items shall be furnished and installed.
- F. The determination of quantities of material and equipment required shall be made by the Contractor from the drawings. Schedules on the drawings and in the specifications are completed as an aid to the Contractor, but where discrepancies arise, the greater number shall govern.

1.05 FIELD MEASUREMENTS

- A. Before ordering any materials or fabricating any supports, etc, the Contractor shall verify all pertinent dimensions at the job site and be responsible for their accuracy.

1.06 QUALITY ASSURANCE

- A. The Label or listing of the specified agency will be acceptable evidence that units conform to the requirements.

- B. Where equipment is specified to conform to the requirements of the ASME Boiler and Pressure Vessel Code for Design, fabrication and installation shall conform to the code in every respect.
- C. All equipment shall be installed in accordance with manufacturer's recommendations. Any proposed deviations shall be requested from the Engineer before installation.
- D. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those of the Base specification, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the performance from the system into which these items are placed. This includes changes found necessary during the testing, adjusting, and balancing phases of the project.

1.07 PRODUCT HANDLING

- A. Cover and protect all materials and equipment stored on-site from weather. Support above ground on temporary basis.
- B. Protect all mechanical products and control devices from damage, dust and construction debris. After installation is completed or while storing inside building, wrap and enclose all mechanical fixtures, equipment and control devices with canvas or heavy mill plastic, secured with wire or cord. Fixtures may be protected with the factory applied heavy paper or carton they are shipped in. Do not remove protection device until room or area is cleaned and free of dust and debris.

1.08 WORK COORDINATION

- A. Each Contractor shall coordinate his work with adjacent work and shall cooperate with all other trades so as to facilitate the general progress of the work. Each trade shall afford all other trades every reasonable opportunity for installation of their work and for the storage of their materials. In no case, will any Contractor be permitted to exclude from the premises or work place any other Contractor in the executing or installation of their work.
- B. Each trade shall perform its work in proper sequence in relation to that of other trades and as approved by the Engineer. Any cost caused by defective or ill-timed work shall be borne by the installation Contractor.
- C. Each Contractor shall arrange his work and dispose of material so as not to interfere with the work or storage of materials of others. Each Contractor shall join their work to that of others in accordance with the intent of the Project Drawings and Specifications.
- D. All trades shall work in cooperation with each other, and fit their work into the structure as job conditions may demand. All final decisions as to right-of-way and run of pipes and ducts, etc. shall be made by the Engineer or an authorized representative.
- E. It shall be the responsibility of the Contractor to keep constant check on the progress of the work so each particular trade can insure proper preparation for installation of that trade's work and not cause delay in the progress of the work. It shall further be the responsibility of the Contractor to periodically make inspection of work in progress and to notify the Engineer when work is complete in compliance with the Project Drawings and Specifications.

1.09 ACCESSIBILITY

- A. Provide access panels to valves, dampers, controls and equipment in walls or above inaccessible ceiling.

1.10 CLEAN-UP

- A. Remove all dust, plaster and construction debris from fixtures, equipment and control devices prior to painting or occupancy by Owner.
- B. Brush clean and apply one coat of rust-resistant paint to all new piping, pipe fittings and weld joints that have rusted during construction, prior to applying pipe insulation.
- C. All piping, pipe covering and ductwork shall be covered and protected from plaster, dust, paint droppings and other construction debris during construction.
- D. Paint all new equipment, which has rusted or had finish marred during construction to the satisfaction of Engineer. Replace if satisfactory restoration cannot be made.

1.11 OPERATING INSTRUCTIONS

- A. Deliver to the Owner, Maintenance and Operating Instruction, with replacement parts list, for all fixtures and equipment.
- B. Include a complete lubrication and maintenance schedule for all new equipment, with types of lubricants and frequencies recommended.
- C. Instruct and demonstrate to the Owner or his representative the operation and servicing (normal maintenance) of all equipment and systems provided. Use qualified manufacturer's representatives to explain heat or cold generation and temperature control equipment.

1.12 SYSTEM START-UP

- A. The mechanical systems included in the construction documents are to be complete and operating systems. The system start-up, testing, balancing, and satisfactory system performance is the responsibility of the Contractor. This shall include all calibration and adjustments of controls, noise level adjustments and final comfort factor adjustments that may be required.
- B. The Contractor shall adjust the mechanical systems and controls at season changes during the one-year warranty period, as required, to provide satisfactory operation and to prove performance of system used in all seasons.
- C. All operating conditions and control sequences shall be simulated and tested during the start-up period. Testing shall also include all interlocks, safety shutdowns, damper position controls, and alarms.

END OF SECTION

SECTION 23 11 26
FACILITY LIQUEFIED-PETROLEUM PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Propane gas piping system.
- B. Valves.
- C. Gas Regulator

1.02 SUBMITTALS

- A. Product Data: Provide data on valves and accessories. Provide manufacturer's catalog information. Indicate valve data and ratings.

1.03 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

1.04 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with all applicable local, state, and federal codes.
- B. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 - PRODUCTS

2.01 PROPANE GAS PIPING BELOW GRADE

- A. Polyethylene Pipe, Tubing, and Fittings: ASTM D 2513 and as recommended by the manufacturer for use with LP gas.
- B. Polyethylene pipe and fitting joints shall be by heat fusion or factory assembled transition fittings.

- C. Contractor shall provide suitable transition coupling at building steel to polyethylene connection.
- D. Contractor shall bury a tracer wire with the underground polyethylene pipe.
- E. Contractor shall provide a cap or closure for any abandon underground polyethylene pipe.

2.02 PROPANE GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53 or A120, Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234, forged steel welding type.
 - 2. Joints: NFPA 58, threaded or welded.

2.03 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2 inches and Under:
 - 1. Ferrous pipe: 150-psi malleable iron, ground joint, threaded unions.
- B. Pipe Size Over 2 inches:
 - 1. Ferrous pipe: 150 psi forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets.

2.04 PLUG VALVES

- A. Manufacturers:
 - 1. Powell
 - 2. Lunkenheimer
 - 3. Crane
- B. Up to and including 2 inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends.

2.05 GAS REGULATOR

- A. Contractor to install gas regulator inside the generator enclosure.
- B. Locate gas regulator as shown on drawings.
- C. Coordinate and maintain 5-foot separation from air intakes, building openings, and ignition sources per NFPA 58.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Provide piping connections to equipment with flanges or unions.
- D. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- E. Route piping in orderly manner and maintain gradient.
- F. Group piping whenever practical at common elevations.
- G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- H. Provide clearance for installation of insulation and access to valves and fittings.
- I. Exercise all necessary care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not erect or install any item that is not clean.
- J. Run pipelines straight and true, parallel to building lines with a minimum use of offsets and couplings. Provide only such offsets as may be required to provide necessary headroom or clearance and to provide necessary flexibility in pipelines.
- K. Changes in direction of pipelines shall be made only with fittings or pipe bends. Changes in size shall be made only with fittings. Miter fittings, face or flush bushings, or street elbows shall be used. All fittings shall be of the long radius type, unless otherwise shown on the drawings or specified. Welded elbows of angles that are not available as standard elbows to form smooth, long radius fittings.
- L. Arrange piping and piping connections so that equipment being served may be serviced or totally removed without disturbing piping beyond final connections and associated shut-off valves.
- M. All pipes shall be cut to exact measurement and installed without springing or forcing except in the case of expansion loops where cold springing is indicated on the drawings.
- N. Particular care shall be taken to avoid creating, even temporarily, undue loads, forces or strains on valves, equipment to building elements with piping connection or piping supports.
- O. Install valves with stems upright or horizontal.
- P. Provide a tracer wire for all underground nonmetallic piping

3.02 PROPANE GAS PIPING SYSTEMS

- A. System shall be approved by Iowa State Plumbing Code.
- B. Provide unions, at piping connections to all equipment, control valves, etc.
- C. Use dielectric unions for connecting dissimilar piping materials, copper, steel, or cast iron pipe, or fittings. Do not support metal piping with dissimilar/incompatible materials.

- D. Provide metal support affixed to building. Wood supports, acceptable on concrete pads, shall be of treated wood.
- E. Seal all openings around piping and pipe sleeves penetrating walls, floors and ceiling, including areas above suspended ceilings.
- F. Branch connections shall be made with standard tee or cross fittings of the type required for the service unless otherwise specified herein or detailed on the drawings.
- G. Threaded Joints:
 - 1. Ream pipe ends and remove all burrs and chips formed in cutting and threading.
 - 2. Protect plated pipe and valve bodies from wrench marks when making up joints.
 - 3. Apply Teflon tape thread lubricant to male threads.
- H. After installation, clean all metal pipes and fittings of rust and scale; then coat with Black paint.

3.03 PIPING SYSTEM TESTING

- A. Testing shall be conducted in the presence of the Owner's representative, the Engineer or their representative. Contractor shall notify the Engineer of proposed tests at least two days prior to testing.
- B. Respective piping Contractor shall provide all equipment required to conduct tests.
- C. Submit report of test results to the Owner and Engineer.
- D. Piping systems shall be tested as scheduled below, but not less the 50 percent above the operating pressure of the system.

System	Test	Test Pressure	Hold Period	Permissible Pressure Drop
Propane Gas	Pneumatic	3 psi inside 15 psi outside	2 hrs.	None

- E. All defects discovered during the tests shall be immediately corrected and piping system shall be retested until it qualifies. Defective joints found in welded piping shall be ground off and rewelded; screwed and soldered joints shall be disassembled, cleaned and rejoined as a new joint.
- F. Piping connected to specialties, or equipment with a lower pressure rating than specified test, shall be left unconnected or valve-off during test.
- G. After testing is completed on gas systems, fill system with gas and soap test all joints for leaks; or test with gas detection meter.

END OF SECTION

DIVISION 26

ELECTRICAL

SECTION 26 00 00
GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes all materials, equipment, and labor necessary for the installation of electrical systems.

1.02 CODES AND STANDARDS

- A. All materials supplied and all work performed shall comply with the latest revisions of applicable codes and standards of the following organizations:
 - 1. National Electric Code (NEC)
 - 2. National Fire Protection Association (NFPA)
 - 3. American National Standards Institute (ANSI)
 - 4. National Electric Manufacturers Association (NEMA)
 - 5. American Society for Testing and Materials (ASTM)
 - 6. Underwriters' Laboratories (UL)
 - 7. Institute of Electrical and Electronic Engineers (IEEE)
 - 8. Occupational Safety and Health Act (OSHA)
 - 9. All state and local codes as they apply.

1.03 GENERAL

- A. Contract Requirements
 - 1. Division 26 of the specifications covers the electrical systems of the project. It includes work performed by the electrical trades as well as trades not normally considered as electrical trades. These specifications are not intended to establish as a bill of material list for items required by the Contract, but are intended to establish material and performance standards
 - 2. Comply with all provisions of the Contract Documents including General Conditions, Supplementary General Conditions, and Division 1 of the specifications.
- B. SCOPE
 - 1. Provide all items and work indicated on the drawings and called for in the specifications. This includes all incidentals, equipment, appliances services, hoisting, scaffolding, supports, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide complete systems. Perform start-up and checkout on each item and system to provide fully operable systems.

2. It is the intent of the drawings and specifications to provide a complete workable system ready for the Owner's operation. Any item not specifically shown on the drawings or called for in the specifications, but normally required to conform with the intent, are to be considered a part of the Contract. Certain terms such as "shall, provide, install, complete, start up" are not used in some parts of these specifications. This does not indicate that the items shall be less than completely installed or that systems shall be less than complete.
3. Examine and compare the electrical drawings and specifications with the drawings and specifications of other trades, and report any discrepancies between them to the Engineer and obtain from him written instructions for changes necessary in the work. At time of bid the most stringent requirements must be included in said bid.
4. Install and coordinate the electrical work in cooperation with other trades installing inter-related work. Before installation, make proper provisions to avoid interferences in a manner approved by the Engineer.
5. The electrical work includes, but is not limited to the following:
 - a. Demolition of existing electrical connections, equipment and devices necessary to accomplish reconfiguration of feeders.
 - b. Temporary power and lighting system.
 - c. Reconfiguration of electrical service entrance, metering and grounding.
 - d. Replacement of distribution panelboard feeders as necessary to accomplish reconfiguration.
 - e. Installation of branch circuit wiring and devices (Conduit, boxes, conductors, etc.) for generator support requirements.
 - f. Rough in and connection to equipment as indicated on plans.
 - g. Coordination with local utility for service rework and switchover outage.
6. Work Not Included:
 - a. Vending equipment installation and connection.
 - b. Low voltage signal/communication equipment (telephone, computer, security, weather reporting system, etc.) installation or wiring.
 - c. Temperature control equipment and wiring.
 - d. Equipment painting (other than touch-up).
 - e. 15kV power service work shall be by local utility.

C. FEES

1. All local fees, permits and services of inspection authorities shall be obtained and paid for by the Contractor.
2. All bids shall include a \$5,000 allowance for each Circa 1965 building site (3 sites total) for utility service and transformer relocations.
3. All bids shall include a \$1,500 allowance for each Circa 2000 building site for utility activity.

D. DEFINITIONS

1. The following definitions are utilized within the drawings specifications:

- a. "PROVIDE" means to supply, purchase, transport, place, erect, and connect. Test and turn over to the Owner, complete and ready for regular operations, the particular work referred to.
- b. "INSTALL" means to join, unite, fasten, link, attach, set up or otherwise connect together before testing and turning over to the Owner, complete and ready for regular operation, the particular work referred to.
- c. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories and all other items customarily required to the proper and complete application for the particular work referred to.
- d. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such work.
- e. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
- f. "AS DIRECTED" means as directed by the Engineer, or his representative.
- g. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed within hung ceilings.

- 2. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.

E. CONTRACT DRAWINGS AND SYMBOLS

- 1. The electrical drawings listed in the Drawing Index, together with these specifications, are an integral part of the Electrical contract, what is called for in one is as binding as if called for in both. In case of conflict, the greater quantity shall prevail, subject to the approval of the Architect-Engineer.
- 2. The drawings are as accurate as planning can determine; however, field verification of all dimensions is directed. Specifications and drawings are for assistance and guidance, but exact locations, distances and levels shall be governed by field conditions.
- 3. The electrical drawings are diagrammatic only, but shall be followed as closely as actual construction of the building and work of other trades will permit. All changes from these drawings, necessary to adapt the work of other trades and to make the work of this Contractor conform to the building as constructed shall be made by the Electrical Contractor.
- 4. Field verify all measurements prior to installation. Electrical drawings shall not be scaled for the purpose of equipment installation, all measurements being derived from Architectural plans and shop drawings.
- 5. The graphic symbols in the "Electrical Symbols Schedule" list on the drawings have been used in part or in whole in the preparation of the electrical drawings accompanying these specifications.
- 6. Riser diagrams and key plans are shown only as a convenience to the Contractor and Electrician making the installation. In case of conflict between a Riser diagram and a floor plan, the greater quantity or better quality shall prevail and shall be subject to the approval of the Architect-Engineer.

7. The locations of lighting fixtures, outlets, panels and other equipment indicated on the drawings are approximately correct. Locations are understood to be subject to revision as may be found necessary or desirable at the time the work is installed in order to meet field conditions or to coordinate with modular requirements of ceilings. Any significant changes in location of outlets, cabinets, etc., necessary in order to meet field conditions shall be brought to the immediate attention of the Engineer and receive his approval before such alterations are made.
8. Exercise particular caution with reference to the location of panels, equipment, switches, etc. Have precise and defined locations approved by the Engineer before proceeding with the installation.
9. The drawings generally do not indicate the exact number of wires in each conduit for the branch circuit wiring of fixtures, and outlets, or the actual circuiting. Provide the correct wire size and quantity as required by the indicated circuiting and/or circuit numbers indicated and control, wiring diagrams, if any, specified voltage drop or maximum distance limitations, and the applicable requirements of the NEC. Derate in the manner discussed in specification Section 26 05 13 - Wires and Cables.
10. Adjust location of conduits, panels, equipment, pull boxes, fixtures, etc. to accommodate the work to prevent interferences, both anticipated and encountered. Determine the exact route and location of each raceway prior to fabrication.
11. Right-of-Way: Lines that pitch to have the right-of-way over those which do not pitch. For example: steam, condensate, and plumbing drains normally have the right-of-way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
12. Make offsets, transitions and changes in direction in raceways and as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the drawings.
13. Wherever the work is of sufficient complexity, prepare additional detail drawings to scale similar or larger than the bidding drawings, prepared on tracing medium of the same size as Contract drawings. Such detailed work to be clearly identified on the drawings as to the area to which it applies. With these layouts, coordinate the work with the work of other trades.

F. COORDINATION OF THE WORK

1. Coordinate and install the electrical work in cooperation with other trades. Before installation, make provisions to avoid interferences. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto, including equipment areas, chases and finished suspended ceilings.
2. The Contractor shall furnish services of an experienced Superintendent, who shall be in constant charge of all work, and who shall coordinate his work with the work of other trades. No work shall be installed before coordinating with other trades.

3. Coordinate, project and schedule work with other trades in accordance with the construction sequence. Transmit to other trades all information required for work to be provided under their respective sections in ample time for installation.
4. The Contractor shall order the progress of his work so as to conform to the progress of the work of other trades and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from the defective or ill-timed work performed under this section shall be borne by the Contractor.
5. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Applicable equipment and materials to be listed by Underwriters' Laboratories and manufactured in accordance with ASME, NEMA, ANSI or IEEE standards and as approved by local authorities having jurisdiction.
- B. All materials used shall bear the Underwriters' Laboratory, Inc. label provided a standard has been established for the material in question.
- C. Use only material manufacturers that are listed on the drawings or approved in the specification. If products and materials are not listed in either of the above, use first class products and materials.
- D. All materials and products furnished by the Contractor shall be new and unused (temporary lighting and power products are excluded) and free from defects, damage and corrosion.
- E. All equipment capacities, etc. are listed for job site operating conditions. All equipment sensitive to altitudes or ambient temperatures to be derated and method of derating shown on the shop drawings. Where operating conditions shown differ from the laboratory test conditions, the equipment to be derated and the method of derating shown on shop drawings.
- F. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material shall be the product of one manufacturer throughout. Multiple manufacturers of the same type of equipment will not be permitted.

2.02 SUBMITTAL

- A. Provide submittals to proposed products in the manner as discussed in the "Shop Drawing" discussion of the Supplemental General Conditions.
- B. Provide submittals for Engineer's review for the following products.
 1. Section 26 05 00
 - a. Conduit
 - b. Boxes

2. Section 26 05 13
 - a. 600-volt conductors
 3. Section 26 24 00
 - a. Panelboard breakers
 4. Section 26 28 16
 - a. Disconnect switches
 5. Section 26 45 00
 - a. Connectors (fittings/clamps)
 6. Section 26 36 00
 - a. Transfer switch
 7. Section 26 32 00
 - a. Package Generator
- C. Submittals shall include, but are not limited to, catalog cuts.

2.03 SUBSTITUTION

- A. Substitutions shall be considered at the time of submittal review
- B. Substituted material shall be equal in quality and performance as that material specified.
- C. The Engineer shall determine the quality and performance acceptability of any substitute submitted for review.
- D. The bid price submitted by the Contractor is assumed to include the use of specified material. There shall be no cost adjustment for the use of specified material.

PART 3 - EXECUTION

3.01 GENERAL

- A. Follow manufacturer's instructions for installing, connecting, and adjusting all equipment. Provide one copy of such instructions to the Engineer before installing any equipment. Provide a copy of the instructions at the equipment during any work on the equipment. Provide all special supports, connections, wiring accessories, etc.
- B. Use mechanics skilled in their trade for all work.
- C. Keep all items protected before and after installation.
- D. Before commencing work, examine all adjoining, underlying, etc., work on which this work is in any way dependent for perfect workmanship. Become thoroughly familiar with actual existing conditions to which connections must be made or which must be changed or altered. Report any condition which prevents performance of first class work.
- E. Perform all tests required by local authorities in addition to tests specified herein, such as life safety systems.

3.02 DEMOLITION AND CONTINUANCE OF EXISTING SERVICES

- A. Coordinate demolition with all trades and Owners. Existing building electrical shall be removed as required to achieve final result of One-Line diagram for site.
- B. Should any existing services, etc., interfere with new construction, the Electrical Contractor shall alter or reroute such existing equipment to facilitate new construction.
- C. Coordinate electrical outages with Owner's representative prior to any interruption in electrical service.

3.03 CLEANING UP

- A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean, subject to the Engineer's instructions, which shall be promptly carried out.
- B. Contractor shall clean all fixtures and equipment at the completion of the project.
- C. All panelboards, wireways, cabinets, enclosures, etc. shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. The Engineer as required shall open equipment for observation.

3.04 TESTING

- A. Complete testing of equipment and systems shall be provided in accordance with the Contract Documents.
- B. Notify the Engineer seven days prior to the test dates. If the Engineer so elect not to witness a specific test, a statement of certification must be forwarded to the Engineer for approval.

3.05 INSPECTIONS

- A. The Contractor shall see that local inspection authorities are notified when inspections are required by code.
- B. The Contract shall provide all necessary assistance to the Inspector when he is making an inspection.

3.06 RECORD OF CHANGES

- A. The Contractor shall maintain at the job site a complete set of electrical plans upon which he shall clearly mark and note in complete detail any changes made to the location and arrangement of electrical equipment, devices and wiring as a result of building construction conditions and change orders. Revisions shall be made daily when they occur.
- B. The Record Drawings shall record all changes from the original drawings and all pertinent information not shown on the original drawings to include:
 - 1. Addenda and change order revisions.
 - 2. Route and location of all underground and concealed feeders.

3. Interconnecting conduit between branch circuit items, junction boxes and panels. Actual route of conduit is not required, only how the various branch items are interconnected.
 4. Circuit numbers for all items where they do not agree with the plans. Circuit numbers on record drawings and panelboard directories must agree.
- C. The Contractor shall prepare "as-built" drawings as required by the Contract Documents. At a minimum, provide one set of construction drawings which clearly and legibly indicate the information required in Paragraph B. Above for record drawings. The "as-built" drawings will be marked "AS-BUILT Drawings" near the title block and dated on each drawing before being turned over to the Owner at the completion of the project.

3.07 PROJECT CLOSEOUT

- A. Provide project closeout documents in accordance with the Contract Documents. See Division 1 - Requirements.
- B. Provide two copies of maintenance and operation manuals consisting of all approved shop drawings and manufacturer's installation and operation instructions shipped with the equipment. Shop drawings and manufacturer's instructions shall be consolidated into a single 3-ring binder for electrical equipment.

END OF SECTION

SECTION 26 05 00
CONDUIT AND ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes furnishing and installing all conduits, fittings, and accessories as specified or indicated.

1.02 QUALITY ASSURANCE

- A. Applicable standards shall be latest revisions, supplements, and amendments to the following:

1. National Electrical Code (NEC).
2. Underwriters' Laboratories, Inc. (UL):
 - a. UL-6 - Rigid Metallic Electrical Conduit.
 - b. UL-467 - Electrical Grounding and Bonding Equipment.
3. American National Standards Institute, Inc. (ANSI):
 - a. C80.1 - Rigid Steel Conduit, Zinc Coated.
 - b. C80A - Fittings for Rigid Metal Conduit and EMT.
4. National Electrical Manufacturers Association (NEMA):
 - a. FB1 - Fittings and Supports for Conduit and Cable Assemblies.

- B. Acceptable Manufacturers:

1. Galvanized Rigid Steel Conduit and Electrical Metallic Tubing:
 - a. Allied Tube and Conduit Corporation.
 - b. Triangle PWC, Inc.
 - c. Republic Steel Corporation.
2. Conduit Fittings for Rigid Metallic Conduit:
 - a. Heavy Duty Fittings:
 - (1) Appleton Electric Company.
 - (2) Crouse-Hinds Company.
 - (3) O.Z. Gedney Company.
3. PVC conduit
 - a. Carbon "PVC Power and Communications Duct"
 - b. CertainTeed Corporation "PVC Utility Duct"
 - c. George-Ingram

PART 2 - PRODUCTS

2.01 DESIGN REQUIREMENTS

- A. UL Listed and labeled on each conduit length, fitting, and accessory.
- B. Sizes of conduit, fittings, and accessories as indicated, specified, or as required by applicable standards or codes.

2.02 RIGID STEEL CONDUIT & FITTINGS

- A. Mild ductile steel, circular in cross section with uniform wall thickness sufficiently accurate to cut clean threads.
- B. Each length threaded on both ends and threads protected by same process as used on each length. Threads cut after protective coatings are applied shall be retreated with the same zinc coating through a second hot-dip process.
- C. All scale, grease, dirt, burrs, and other foreign matter removed from inside and outside prior to application of coating materials.
- D. Galvanized by the hot-dip process as follows:
 - 1. Interior and exterior surfaces coated with a solid, unbroken layer of 99 percent virgin zinc by dipping.
 - 2. Coating not to show fixed deposits of copper after four 1-minute immersions in a standard copper sulfate solution.
 - 3. One coat of zinc chromate finish on inside and outside surfaces to prevent oxidation and white rust.
- E. Couplings, elbows and fittings shall be fabricated, coated and finished by the same process as conduit.
- F. All fittings and couplings are to be full-threaded type, split or setscrew types are not allowed.
- G. Uni-Swivel or Uni-Couple or other similar types of couplings will not be permitted.
- H. Minimum size shall be 3/4 inch nominal diameter.

2.03 ELECTRICAL METALLIC TUBING & FITTINGS

- A. Shall be UL listed.
- B. Shall be steel, zinc coated on the outside, and enamel coated on the inside surface.
- C. Connectors and fittings shall be of the compression type

2.04 PLASTIC/PVC CONDUIT

- A. Fabricated from self-extinguishing high-impact polyvinyl chloride.
- B. Fittings and accessories fabricated from same material as conduit.
- C. Solvent-cement type joints as recommended by manufacturer.
- D. Inside diameter no less than that of rigid steel conduit.
- E. Dielectric strength as minimum of 400 volts per mil.

- F. Rated and labeled for use with 90 degrees C rated conductors.
- G. Each length of conduit furnished with one belled end per length.
- H. To be Schedule 40 unless noted otherwise, or installed under vehicle drives or parking areas. Schedule 80, PVC conduit shall be used in these areas where Schedule 40 exceptions are required or noted.
- I. Flexible nonmetallic conduit (Smurf tube) shall be allowable when encased in concrete or in floor.

2.05 INGROUND HAND HOLES

- A. For reference in event of replacement of field construction damaged units.
- B. Boxes shall be non-corrosion composite material, green in color to blend into grass.
- C. Inside dimensions of hand hole shall be 12 inches by 12 inches with a 12-inch depth, no bottom. Provide extensions as required for a "clean installation".
- D. Shall have a bolt on matching cover.
- E. Shall be a Quazite Model No. PC1212BA12 with a No. PC1212CA00 cover with "Electric" logo on cover; or equal in concrete as 12-inch round with steel lid. Hand-holes for utility primary shall meet local utility requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install all exposed conduits in a neat manner and parallel to or at right angles to building lines and in accordance with the NEC.
- B. Install underground conduits at depths indicated on drawing or as required by the NEC. Shift elevation as required to clear existing underground utilities.
- C. Running threads will not be permitted.
- D. Coat all field cut threads, scars, or abrasions in galvanized conduit with an approved organic zinc rich primer equivalent to Koppers' "Organic Zinc".
- E. Coat all thread connections with anti-oxidizing compound approved by conduit manufacturer. Compound shall be suitable for steel-to-steel, steel-to-aluminum, and steel-to-PVC connections.
- F. Seal all conduit penetrations through concrete floors or walls with non-shrinking grout.
- G. Carefully ream ends of all conduit lengths after cutting to eliminate sharp burrs.
- H. Clean all conduits with swabs and mandrels after installation.
- I. Install a nylon or polypropylene pull rope in all communications conduits (above and below grade) and all spare underground ducts. Cap spare underground ducts for future use.

- J. Conduit fittings shall be installed as specified, indicated, or necessary.
- K. Conduit support system shall be constructed with sufficient rigidity to hold all conduits in permanent and neat alignment.
- L. Conduit support members, clamps, and hardware shall be galvanized steel.
- M. Conduit Types shall be used as follows:
 - 1. Underground or outside conduit, shall be PVC schedule 40 or 80, unless noted as being GRS conduit. Above grade shall be GRS or intermediate grade metal.
 - 2. Flexible nonmetallic shall be allowed when encased in concrete or in floor.
- N. Underground PVC conduits shall transition to galvanized rigid steel conduit before turning up to exit earth or concrete floor.
- O. Install hand holes with the top flush with grade. Install box on 8 inches of crushed compacted rock to support box and to provide drainage. Conduits shall turn up into hand hole with a 90-degree bend. Conduits shall have bushings on ends and protrude 2 inches above gravel. Seal conduit openings with mastic after wires are installed. Empty spare conduits shall be plugged to prevent debris from entering conduits.

END OF SECTION

SECTION 26 05 13
WIRES AND CABLES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes furnishing and installing 600-volt power, control cable, and instrumentation and communication cable.

1.02 QUALITY ASSURANCE

- A. Applicable standards shall be the latest revisions, supplements, and amendments to the following:
1. National Electrical Code (NEC)
 2. Underwriters' Laboratories, (UL) - 1072
 3. Institute of Electrical and Electronics Engineers (IEEE) - 383
 4. Insulated Cable Engineers Association (ICEA) - S48-516
 5. Association of Edison Illuminating Companies (AEIC) - CS6
 6. American Society for Testing and Materials (ASTM) - B8
- B. Acceptable Manufacturers:
1. Pulling Lubricant
 - a. American Polywater Corporation
 - b. Ideal Industries, Inc.
 2. 600 Volt Cable (120/240 volt power and lighting circuits)
 - a. Rome Cable Corporation
 - b. Triangle
 - c. Southwire

PART 2 - PRODUCTS

2.01 PULLING LUBRICANTS

- A. Pulling compound shall be listed by manufacturer as compatible with cable being pulled.
- B. Pulling compound shall contain no waxes, greases, silicones, or polyabkalene glycol oils or waxes.
- C. Pulling compound shall be rated for the air temperature in which the installation is being performed.
- D. Contractor shall follow the manufacturer's recommendation of application of pulling compound if used.

2.02 SINGLE-CONDUCTOR 600-VOLT WIRE

- A. Type THWN Wire (Interconnection Cable for Power, Lighting or Control)
 - 1. Material: Annealed uncoated copper in accordance with ASTM B3.
 - 2. Size: As indicated on the drawings.
 - 3. Description: Single-conductor stranded wire, 600-volt, and 75 degrees C temperature rating.
 - 4. Insulation: Heat- and moisture-resistant thermoplastic.
 - 5. Jacket: Smooth nylon, 4 mils thick (minimum).
 - 6. Identification: Mark surface of wire with manufacturer's identification, conductor size, and voltage rating.
 - 7. Minimum conductor size:
 - a. Power: #12 AWG
 - b. Control circuits: #14 AWG

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Cable shall be stored covered and elevated from ground on blocks to prevent contamination from mud, dirt, or water.
- B. Contractor shall swab and clean each conduit before installation of cable commences. Swab methods shall consist of wire brush and foam swab utilized together in proper size for conduit.
- C. Contractor shall use pulling lubricant as required or recommended by manufacturer to minimize strain on wires or cables.
- D. Ground Cable
 - 1. Reference Section 26 45 00 of this specification for installation of ground cable.
 - 2. Maintain color coding on grounding circuits as follows:
 - a. Green - Equipment grounding conductor.
- E. 600-Volt Cable
 - 1. Install where indicated on the drawings with size as indicated.
 - 2. Power circuit conductors shall be color coded as follows:
 - a. Black - Line 1 or Line 2
 - b. Green - Ground
 - c. White - Neutral
 - 3. 600-volt cable shall be derated for ambient temperature per NEC.

4. 600-volt cable shall be derated for fill by increasing the size to meet the NEC derating percentage stated for the number of current carrying conductors (including all neutral conductors) using the following nonderated schedule:
 - a. 20 amp #12 AWG
 - b. 30 amp #10 AWG
 - c. 50 amp #8 AWG

F. Controls and Instrumental Cable

1. Provide manufacturer's supplied or recommended cable.

END OF SECTION

SECTION 26 24 00
PANELBOARDS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes furnishing and installing all distribution panelboard, as shown on the drawings.

1.02 QUALITY ASSURANCE

- A. Applicable standards shall be the latest revisions, supplements, and amendments to the following:
 - 1. National Electrical Code (NEC).
 - 2. Underwriters' Laboratories (UL).
 - 3. National Electrical Manufacturers Association (NEMA).
 - 4. American National Standards Institute (ANSI).
- B. Acceptable Manufacturers (Determine by equipment at site)
 - 1. General Electric
 - 2. Square D
 - 3. Cutler-Hammer
 - 4. Engineer approved equal

PART 2 - PRODUCTS

2.01 PANELBOARDS

- A. Panelboards shall have main rating, main breaker, number of poles, and branch breakers as shown by the panelboard schedules on the drawings. Panels shall be UL labeled.
- B. 240/120-volt, single-phase, 3-wire panels shall have 100 percent rated neutral bus with a UL series connected rating of 22,000 AIC.
- C. Panelboards shall be equipped with bolt on breakers.
- D. GFI breakers shall be installed where panel schedule calls for ground fault breakers and as by specifications or as per manufacturer's recommended practice.
- E. Breakers shall not be of "Tandem" design.

- F. NEMA classification of panels shall be NEMA 1 unless noted otherwise on the drawings or specifications.

PART 3 - EXECUTION

3.01 GENERAL

- A. Breaker placement shall be as determined to fit panel(s).
- B. Contractor shall TYPE panel schedule on schedule card at the end of the job. Cards shall accurately and clearly reflect the circuits serviced by the breakers.
- C. Modify existing schedule neatly at project completion.

END OF SECTION

SECTION 26 32 00
PACKAGED ENGINE GENERATOR SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section includes:
 - 1. This section describes:
 - a. Packaged engine generator set.
 - b. Radiator.
 - c. Heat exchanger.
 - d. Exhaust silencer and fittings.
 - e. Fuel fittings.
 - f. Control panel.
 - g. Battery and charger.
 - h. Weatherproof enclosure.
- B. Related work specified elsewhere:
 - 1. Section 26 00 00 - Electrical General Provisions
 - 2. Section 26 36 00 - Enclosed Transfer Switch

1.02 REFERENCES

- A. NEMA AB3 - Molded Case Circuit Breakers.
- B. NEMA MG1 - Motors and Generators.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum.)
- D. NFPA 30 - Flammable and Combustible Liquids Code.
- E. NFPA 70 - National Electrical Code.
- F. NFPA 99 - Health Care Facilities.
- G. NFPA 101 - Life Safety Code.
- H. NFPA 110 - Emergency and Standby Power Systems.

1.03 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Shop Drawings: Indicate electrical characteristics and connection requirements. Show plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, and electrical diagrams, including schematic and interconnection diagrams.

- C. Product Data: Provide data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, day tank, and remote radiator.
- D. Test Reports: Indicate results of performance testing.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.04 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division 1.
- B. Operation Data: Include instructions for normal operation.
- C. Maintenance Data: Include instructions for routine maintenance requirements, service manuals for engine and day tank, oil sampling and analysis for engine wear, and emergency maintenance procedures.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with NFPA 110.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience, and with service facilities within 100 miles of Project.
- B. Supplier: Authorized distributor of specified manufacturer with minimum three years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 1.
- B. Accept unit on site on skids. Inspect for damage.
- C. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

1.08 MAINTENANCE SERVICE

- A. Furnish service and maintenance of engine generator for one year from date of Substantial Completion.

1.09 MAINTENANCE MATERIALS

- A. Furnish one set of tools required for preventative maintenance of the engine generator system. Package tools in adequately sized metal tool box.

1.10 EXTRA MATERIALS

- A. Provide two of each fuel, oil and air filter element for engine generator system.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Cummins/Onan
- B. Substitutions: Under provisions of Section 26 00 00. Caterpillar and Kohler are approved manufacturers.

2.02 PACKAGE ENGINE GENERATOR SYSTEM

- A. Description: NFPA 110, engine generator system to provide source of power for Level 2 applications.
- B. Standby System Capacity: Plan stated KW 120 degrees C rise at elevation of 3,000 feet above sea level, rating using engine-mounted radiator engine mounted heat exchanger.

2.03 ENGINE

- A. Type: Water-cooled inline or V-type, two stroke cycle, internal combustion engine.
- B. Rating: Sufficient to operate under 10 percent overload for one hour in an ambient of 90 degrees F at elevation of 3,000 feet.
- C. Fuel System: Propane fuel.
- D. Engine Speed: 1800 rpm.
- E. Governor: Isochronous type to maintain engine speed within 0.5 percent, steady state, and 5 percent, no load to full load, with recovery to steady state within 2 seconds following sudden load changes.
- F. Safety Devices: Engine shutdown on high water temperature, low oil pressure, overspeed, and engine overcrank. Limits as selected by manufacturer.
- G. Engine Starting: DC starting system with positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Include remote starting control circuit, with MANUAL-OFF-REMOTE selector switch on engine-generator control panel.
- H. Engine Jacket Heater: Thermal circulation type water heater with integral thermostatic control, sized to maintain engine jacket water at 90 degrees F, and suitable for operation on 120 volts AC.
- I. Radiator: Radiator using glycol coolant, with blower type fan, sized to maintain safe engine temperature in ambient temperature of 110 degrees F. Radiator air flow restriction 0.5 inches of water maximum.

- J. Engine Accessories: Fuel filter, lube oil filter, intake air filter, lube oil cooler, fuel transfer pump, fuel priming pump, gear-driven water pump. Include fuel pressure gauge, water temperature gauge, and lube oil pressure gauge on engine/generator control panel. Provide means of assuming low temperature starting of vapor propane fuel.
- K. Mounting: Provide unit with suitable spring-type vibration isolators and mount on structural steel base.

2.04 GENERATOR

- A. Generator: NEMA MG1, single-phase, 4-pole, reconnectable brushless synchronous generator with brushless exciter.
- B. Rating: At 0.8 power factor, 120/240 volts, 60 Hz at 1800 rpm.
- C. Insulation Class: F.
- D. Enclosure: NEMA MG1, open drip proof. Provide in manufacturer's standard color of approximate description of "Sand". Standard Green or Yellow are not acceptable.
- E. Voltage Regulation: Include generator-mounted volts per hertz exciter-regulator to match engine and generator characteristics, with voltage regulation plus or minus 1 percent from no load to full load. Include manual controls to adjust voltage droop, voltage level (plus or minus 5 percent) and voltage gain.

2.05 ACCESSORIES

- A. Residential type enclosure to limit sound emissions to 60dB at 300 feet.
- B. Exhaust Silencer: Residential type silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, sized in accordance with engine manufacturer's instructions.
- C. Fuel connection, fittings, and metering connection suitable for supplier.
- D. Batteries: Heavy duty, diesel starting type lead-acid storage batteries, 170 ampere-hours minimum capacity. Match battery voltage to starting system. Include necessary cables and clamps.
- E. Battery Tray: Treated for electrolyte resistance, constructed to contain spillage.
- F. Battery Charger: Current limiting type designed to float at 2.17 volts per cell and equalize at 2.33 volts per cell. Include overload protection, full wave rectifier, DC voltmeter and ammeter, and 120 volts AC fused input. Provide enclosure to meet NEMA 250, Type 1 requirements.
- G. Line Circuit Breaker: NEMA AB 3, molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole, sized in accordance with NFPA 70. Include battery-voltage operated shunt trip, connected to open circuit breaker on engine failure. Unit mount in enclosure to meet NEMA 250, Type 1 requirements.
- H. Engine-Generator Control Panel: NEMA 250, Type 1 mounted control panel enclosure with engine and generator controls and indicators. Include provision for padlock and the following equipment and features:

1. Frequency Meter: 45-65 Hz. range, 3.5 inch dial.
 2. AC Output Voltmeter: 3.5 inch dial, 2 percent accuracy, with phase selector switch.
 3. AC Output Ammeter: 3.5 inch dial, 2 percent accuracy, with phase selector switch.
 4. Output voltage adjustment.
 5. Push-to-test indicator lamps, one each for low oil pressure, high water temperature, overspeed, and overcrank.
 6. Engine start/stop selector switch.
 7. Engine running time meter.
 8. Oil pressure gauge.
 9. Water temperature gauge.
 10. Auxiliary Relay: 3PDT, operates when engine runs, with contact terminals prewired to terminal strip.
 11. Additional visual indicators and alarms as required by NFPA 110.
 12. Remote Alarm Contacts: Pre-wire SPDT contacts to terminal strip for remote alarm functions required by NFPA 110 and include a “proof of run” indication.
 13. Shall include Amp Sentry, single-phase, fault protection.
- I. Annunciator Panel: Surface mounted panel with brushed stainless steel. Provide audible and visible indicators and alarms required by NFPA 110.
1. High battery voltage (alarm).
 2. Low battery voltage (alarm).
 3. Low fuel (alarm).
 4. System ready.
 5. Anticipatory-high water temperature.
 6. Anticipatory-low oil pressure.
 7. Low coolant temperature.
 8. Switch in off position (alarm).
 9. Overcrank (alarm).
 10. Emergency stop (alarm).

11. High water temperature (alarm).
 12. Overspeed (alarm).
 13. Low oil pressure (alarm).
 14. Line power available.
 15. Generator power available.
 16. Lamp test and horn silence switch.
- J. Weather-Protective Enclosure: Reinforced steel housing allowing access to control panel and service points, with lockable doors and panels. Include fixed louvers, battery rack, and silencer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.02 FIELD QUALITY CONTROL

- A. Field testing will be performed by factory trained personnel in the present of an Owner's representative.
- B. Provide full load test utilizing portable test bank, if required, for four hours minimum. Simulate power failure including operation of transfer switch, automatic starting cycle, and automatic shutdown and return to normal.
- C. Record in 20-minute intervals during four hour test:
1. Kilowatts.
 2. Amperes.
 3. Voltage.
 4. Coolant temperature.
 5. Room temperature.
 6. Frequency.
 7. Oil pressure.
- D. Test alarm and shutdown circuits by simulating conditions.
- E. Provide Owner with Test Record.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems per manufacturer's recommended practice.

3.04 ADJUSTING

- A. Adjust work under provisions of Division 1.
- B. Adjust generator output voltage and engine speed.

3.05 CLEANING

- A. Clean work under provisions of Division 1.
- B. Clean engine and generator surfaces. Replace oil and fuel filters.

3.06 DEMONSTRATION

- A. Provide systems demonstration for Owner for demonstration of operation and for training.
- B. Describe loads connected to system and restrictions for future load additions.
- C. Simulate power outage by interrupting normal source, and demonstrate that system operates to provide power.

END OF SECTION

SECTION 26 36 00
ENCLOSED TRANSFER SWITCH

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Automatic transfer switch.

1.02 RELATED SECTIONS

- A. Section 26 00 00 - Electrical General Provisions.
- B. Section 26 32 00 - Package Engine-Generator System.

1.03 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. NEMA ICS 1 - General Standards for Industrial Control and Systems.
- C. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies.
- D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

1.04 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data: Provide catalog sheets showing voltage, switch size, ratings and size of switching and overcurrent protective devices, operating logic, short circuit ratings, dimensions, and enclosure details.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.05 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division 1.
- B. Operation Data: Include instructions for operating equipment. Include instructions for operating equipment under emergency conditions when engine generator is running.
- C. Maintenance Data: Include routine preventative maintenance and lubrication schedule. List special tools, maintenance materials, and replacement parts.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience, and with service facilities within 100 miles of project.
- B. Supplier: Authorized distributor of specified manufacturer with minimum three experiences.

1.07 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 1.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to internal components, enclosure and finish.

1.09 FIELD MEASUREMENTS

- A. Verify that field measurements are as instructed by manufacturer.

1.10 MAINTENANCE SERVICE

- A. Furnish service and maintenance of transfer switch for one year from date of Substantial Completion.

1.11 MAINTENANCE MATERIALS

- A. Provide maintenance materials under provisions of Division 1.
- B. Provide two of each special tool required for maintenance.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Onan
- B. Asco
- C. Kohler
- D. Engineer approved equal by Caterpillar

2.02 AUTOMATIC TRANSFER AND MANUALLY OPERATED SWITCH

- A. Description: NEMA ICS 2, automatic transfer switch with manual maintenance capability.

2.03 SERVICE CONDITIONS

- A. Service Conditions: NEMA ICS 1.
- B. Temperature: 90 degrees F.
- C. Altitude: 3,300 feet.

2.04 RATINGS

- A. Voltage: 240 volts, 1-phase, 3- wire, 60 Hz.
- B. Switched Poles: Two with open transition.
- C. Load Inrush Rating: Combination load.
- D. Continuous Rating: 600 amperes.

2.05 PRODUCT OPTIONS AND FEATURES

- A. Indicating Lights: Mount in cover of enclosure to indicate normal source available, alternate source available, and switch position.
- B. Test Switch: Mount in cover of enclosure to simulate failure of normal source.
- C. Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate to normal source.
- D. Transfer Switch Auxiliary Contacts: 1 normally open; 1 normally closed.
- E. Normal Source Monitor: Monitor normal source voltage and frequency; initiate transfer when voltage drops below 85 percent or frequency varies more than 3 Hertz from rated nominal value.
- F. Alternate Source Monitor: Monitor alternate source voltage and frequency; inhibit transfer when voltage is below 85 percent or frequency varies more than 3 Hertz from rated nominal value.
- G. Switched Neutral: Overlapping contacts.

2.06 AUTOMATIC SEQUENCE OF OPERATION

- A. Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor.
- B. Time Delay To Start Alternate Source Engine Generator: 0 to 5 seconds, adjustable.
- C. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.
- D. Time Delay Before Transfer to Alternate Power Source: 0 to 10 seconds, adjustable.
- E. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.
- F. Time Delay Before Transfer to Normal Power: 0 to 10 seconds, adjustable; bypass time delay in event of alternate source failure.
- G. Time Delay Before Engine Shut Down: 0 to 5 minutes, adjustable, of unloaded operation.
- H. Engine Exerciser: Start engine every 7 days; run for 30 minutes before shutting down. Bypass exerciser control if normal source fails during exercising period.

- I. Alternate System Exerciser: Transfer load to alternate source during engine exercising period.

2.07 ENCLOSURE

- A. Enclosure: NEMA, Type 3R.
- B. Finish: Manufacturer's standard Sand (preferred) or Gray enamel.

2.08 VENDOR SERVICE

- A. 100 Amp unit for vendor building or interior vendor panel may be a residential grade switch.
- B. The Circa 2000 building may have sufficient space within the building to mount this switch. Contractor is encouraged to work with Owner to facilitate this occurrence at the Cedar and Scott sites.
- C. If this switch is interior-mounted to the building, NEMA 1 enclosure is acceptable with a lockable front.
- D. Interior-mounted units shall be set to not transfer power to vendor panel during weekly test.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify conditions.
- B. Verify that surface is suitable for transfer switch installation.

3.02 INSTALLATION

- A. Install transfer switches in accordance with manufacturer's instructions.
- B. Provide engraved plastic nameplates with 1/4-inch lettering and attach with mechanical fastening and nameplate adhesive.
- C. Ensure that switch mounting is secure to building structure or floor.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems under provisions of Division 1.

3.04 DEMONSTRATION

- A. Provide systems demonstration under provisions of Division 1.
- B. Demonstrate operation of transfer switch in normal and emergency modes.

END OF SECTION

SECTION 26 45 00
GROUNDING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes furnishing and installing copper grounding cable for the equipment and structures.

1.02 QUALITY ASSURANCE

- A. Applicable standards shall be the latest revisions, supplements, and amendments to the following:
1. National Electrical Code (NEC).
 2. American Society for Testing and Materials (ASTM) - B8.
 3. National Electrical Safety Code (NESC).
- B. Acceptable Manufacturers
1. Ground Clamps and Bars
 - a. Burndy Corporation
 - b. Thomas & Betts Company
 2. Grounding Lugs and Grounding Splice Connectors
 - a. Burndy Corporation
 - b. Thomas & Betts Company
 - c. Anderson

PART 2 - PRODUCTS

2.01 GROUNDING SYSTEM

- A. Cable to equipment grounds shall be with compression type bolted lug connections. Lugs shall be copper, tin plated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Contractor shall ground all equipment as shown on the drawings. Ground shall be in conformance with the NEC.
- B. Contractor shall remove all paint, rust, or other non-conducting material from grounding contact surfaces before making connections.
- C. There shall be no splicing of grounding electrode cables unless it is shown on the drawings or approved by the Owner.

END OF SECTION

DIVISION 31

EARTHWORK

SECTION 31 11 00

CLEARING AND GRUBBING

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Remove shrubs within the construction area and/or as indicated.
- C. Related Sections and Work:
 - 1. Excavating, Stripping Topsoil, Filling, Grade: Division 31.

1.02 PROTECTION

- A. All remaining portions of property not scheduled for clearing and grubbing shall be completely protected during clearing and grubbing and removal of material. Any resulting damage shall be repaired or replaced to like new condition by the Contractor responsible.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide all barricades, fences, and warning lights as required to protect persons and property in accordance with all applicable Iowa DOT Specifications and regulations.

PART 3 EXECUTION

3.01 CLEARING/PROCEDURE

- A. In all activities, comply with pertinent regulations of governmental agencies having jurisdictions.
- B. Clearing and Grubbing:
 - 1. Protect all trees and other plant life which are subject to damage during construction.
 - 2. No burning on site permitted.
- C. Disposal of Materials:

1. All material shall become property of the Contractor and shall be removed from the Owner's site by the Contractor. No prolonged accumulation of debris will be allowed.
 - a. Remove all material from the site as removed. Storage of material on the site will not be allowed.
- D. Maintaining Traffic:
1. Ensure minimum interference with roads, driveways, sidewalks, and adjacent facilities.
 - a. Coordinate with Contractor staging requirements and areas defined on drawings.
 2. Do not close or obstruct roads, driveways, and sidewalks without permission from authorities having jurisdiction.
 3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

3.03 CLEAN UP/ACCEPTANCE

- A. Clean up trash and debris caused by clearing operations under this section, keeping premises, roads, and adjacent property clean and neat at all times.

END OF SECTION

SECTION 31 23 00

EXCAVATION AND FILL

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Excavation, backfill, and fill.
 - a. Compaction of materials relative to its placement.
 - 2. All excess material shall be removed from the site.
 - 3. Supply all additional material required to complete the earthwork as indicated on the drawings or herein specified.
 - 4. Provide field-testing, approvals, and reports as herein specified.
 - 5. Note: Ground water could possibly be encountered during excavation.
 - 6. This Contractor shall provide and maintain all erosion and sediment controls, silt fencing and bale check required by governing authorities.
 - a. Coordinate providing this work with all other excavation and earth moving sections of work.

1.02 RELATED SECTIONS

- A. Excavation, filling, compacting required in connection with utility work, and mechanical and electrical work: Divisions 23 and 26.

1.03 QUALITY ASSURANCE

- A. Required Testing:
 - 1. The Owner reserves the right to require and pay for field tests performed by an Iowa licensed professional Engineer. The engineering testing (geotechnical) firm, that shall make the following tests and/or special inspections for compliance with this section of work. The Contractor shall give the testing Engineer/firm a 24-hour notice prior to a required test(s).
 - 2. Excavation Testing:
 - a. Verify that the bottom of all excavations shall be undisturbed stable soils capable of providing the bearing capacity for the item it is supporting.
 - 3. Fill Testing:
 - a. Verify that the bottom of all backfill excavations is free of unstable soil before filling is commenced.
 - b. Perform density tests on all backfill.
 - c. Location of the test shall be as directed by the testing Engineer/firm.

4. The test results shall confirm the required density, compaction, and bearing specified. If the tests are below these requirements, the Contractor shall remove, refill, recompact, and test again at his/her own expense until the specified requirements are achieved.

1.04 PROTECTION

- A. Protect all utilities against damage.
- B. Provide all required barricades and post warning lights for safety of persons.
- C. Protect structures, utilities, and other facilities immediately adjacent to excavations from damage caused by settlement, lateral movement, undermining, washout and other hazards.
 1. Contractor is entirely responsible for strength and adequacy of bracing and shoring, and for safety and support of construction from damage or injury caused by the lack thereof or by movement or settlement.
- D. Comply with all applicable statutes, ordinances, codes and regulations regarding safety and health including local, state, federal and OSHA (Occupational Safety and Health Administration) jurisdictions.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Backfill: All material placed in excavations outside the structure limits is classified as "backfill."
 1. Clean earth free of organic materials.
 2. No solid material larger than 6" in its largest dimension shall be allowed.
 3. Excavated material, below topsoil, from the site is acceptable for backfill.
- B. Granular fill or fill: Material placed under construction is classified as "fill."
 1. Clean, granular fill, with no more than 5 percent of material passing a No. 200 sieve shall be placed immediately under the generator pad and adjacent PCC.
 2. The first 6" of fill immediately under sidewalks shall be clean granular fill.
- C. Topsoil: Topsoil is to be black, fertile and native to the area, free of stones, lumps, clods, plants, roots, sticks or other extraneous materials.
 1. Provide 6" minimum topsoil under all sodded, seeded, or planted areas.
- D. Barricades, fences, warning lights as required to protect persons and property, shall be in accordance with all applicable codes and regulations.

PART 3 EXECUTION

3.01 INSPECTION

A. Existing Utilities:

1. Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during excavation operations.
2. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Engineer immediately for directions as to procedure. Cooperate with the Owner, and public and private utility facilities in operation. Repair damaged utilities to the satisfaction of the utility owner.
3. Do not interrupt existing utilities serving facilities occupied and used by the owner or others, except when permitted in writing by the Engineer and then only after acceptable temporary utility services have been provided.

3.02 INSTALLATION/PROCEDURE

A. Stripping:

1. Strip all black dirt and topsoil to its entire depth, 6" minimum, from areas to be covered by exterior concrete and from areas to be cut or filled.
 - a. Areas to be stripped shall first be scraped clean of all brush, weeds, grass, roots and other materials. This material shall be removed off-site.
 - b. Stockpile the topsoil obtained on the site using care not to mix with subsoil. Pile in locations where it will not interfere with the building or construction operations.
 - c. This black dirt is to be spread as indicated under grading of this section.
 - d. Excess topsoil may be used for general fill for grading except not under any form of construction.

B. General Excavation:

1. Excavate for all subgrade work shown or specified to dimensions indicated, plus sufficient space to permit erection of forms and shoring.
 - a. Do all excavation of every description and of whatever substances encountered to dimensions and elevations indicated and/or specified herein, unless otherwise qualified herein.
2. Contractor shall be responsible to keep all excavations free of water during the entire process of work regardless of cause, source or nature of the water. Dewatering in order to complete this section of work shall be considered incidental to the earthwork.
3. Provide all shoring and bracing necessary to prevent cave-in of excavations or damage to structure. Remove shoring and piling before backfilling is completed, but not until permanent supports are in place.
4. Unauthorized Excavation: If materials are removed beyond indicated subgrade elevations or side dimensions, fill at no extra cost to the owner.
5. Removal of Unsatisfactory Soil Materials:

- a. Excavate unsatisfactory soil materials encountered that extend below the required elevations, to the additional depth directed by the Engineer or Geotechnical Engineer.
- b. Such additional excavation, provided it is not due to the fault or neglect of the Contractor, will be measured as directed by the Engineer and paid for as a change in the work.

C. Filling and Backfilling:

1. Place backfill and fill materials in layers not more than 8" in loose depth. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content of the soil material. Compact each layer to the required percentage of maximum density for each area classification.
2. Do not place backfill or fill material on surfaces that are muddy, frozen or contain frost or ice.
3. The finished compacted areas shall be brought to a reasonable true and even plane at the required elevations and shall be approved by the Engineer prior to further construction operations thereon.
4. Place backfill and fill materials evenly adjacent to structures, to the required elevations. Take care to prevent wedging action of the backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift. Provide bracing to maintain the structure true to required form.
5. Use power-drive hand tampers for compacting materials adjacent to structures.
6. All exterior concrete slabs on grade shall be placed on a bed of sub-base material as specified, compacted as specified, evenly graded and free from all rubbish and debris.

D. Compaction:

1. Control soil compaction during construction for compliance with the percentage of maximum density specified for each area classification.
2. Provide not less than the percentages of the maximum standard proctor density, ASTM D 698, of the same soil material compacted at optimum moisture content, for the actual density of each layer of soil material-in-place.
3. Where the subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply the required amount of water to the surface of subgrade, or layer of soil material in such a manner as to prevent free water appearing on the surface during or subsequent to compaction operations.
4. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified percentage of maximum density.
5. When the existing ground surface has a density less than that specified under "Compaction" for the particular area classification, break up the ground surface, pulverize, moisture condition to the optimum moisture content and compact to the required depth and percentage of maximum density.
6. Where completed areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, re-shape and compact to the required density prior to further construction. Use hand tamping for recompaction over underground utilities, if any.

7. Compaction over ditches less than 3 feet in width and around perimeter of walls and columns for distance of 3 feet from the wall or column shall be done by the use of mechanical hand compactors such as a Jackson Compactor.
- E. Grading:
1. Do all cutting, filling, compacting of fills and grading required to bring the entire project area, outside of buildings to subgrades as follows:
 - a. For surfaced areas (roadways, parking areas, curbs, service courts, steps and walks) to the underside of the respective surfacing, sub-base or base course, as fixed by the finished grades.
 - b. For lawn and planted areas, to 6" below finished grade. Fill and finish grade of such areas with topsoil to bring grade to elevations shown.
 - 1) Topsoil shall be prepared smooth, to final grade and loosened, ready to receive sod or seeding.
 - c. Slope uniformly to meet elevations at walks, drives, etc., and so as to prevent water pockets or irregular surface changes. The subgrade shall be sloped to provide drainage away from the building walls in all directions.
- F. Remove all waste materials, including excavated material classified as unsatisfactory soil material, trash and debris from the owner's property and legally dispose of it.
- G. Maintaining Traffic:
1. Ensure minimum interference with roads, sidewalks and adjacent facilities.
 2. Do not close or obstruct roads or passageways without permission from the Engineer.
 3. If required by the Engineer, provide alternate routes around closed or obstructed traffic ways.

3.03 CLEAN UP/ACCEPTANCE

- A. Protect newly graded areas from traffic and erosion, and keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded and rutted areas to the specified tolerances.
- C. Keep all travel routes free of tracked or spilled materials.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Trenching, backfilling, and compacting for all underground utility lines and services including but not limited to the following:
 - a. Gas lines.
 - 2. All excess material shall be removed from the site.
 - 3. Provide all additional material required to complete the work for this Section as indicated or required.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Backfill Materials: All material placed in trench excavations is classified as "backfill."
 - 1. Clean earth graded and free of organic materials.
 - 2. No solid material larger than 6" in its largest dimension shall be used.
 - 3. Excavated material, below topsoil, from the site is acceptable for backfill.
 - 4. Backfill beneath and within 5' of pavement areas shall be Special Backfill in accordance with Section 4132 of the Standard Specifications.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Utilities:
 - 1. Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the Contracting Authority.
 - 2. If active utility lines are encountered and are not shown on the Drawings, or otherwise made known to the Contractor, promptly take necessary steps to assure that the service is not interrupted.
 - 3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at not additional cost to the Contracting Authority.

4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure his instructions.
 5. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.
- B. Protection of Persons and Property:
1. Barricade open holes and depressions occurring as part of the work, and post warning lights on property adjacent to or with public access.
 2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
 3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.
- C. Dewatering:
1. Remove all water, including rainwater, encountered during trench and substructure work to an approved location by pumps, drains, and other approved methods.
 2. Keep trenches and site construction area free from water.
- D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- E. Maintain access to adjacent areas at all times:
- F. Trenching:
1. Contractor shall provide all necessary protection of the work and for the safety of personnel.
 - a. Prior to backfilling, remove all such protection materials.
 - b. Do not permit such protection materials to remain in the trenches, except when in the opinion of the Engineer, field conditions or the type of materials are such as to make removal of materials impractical. In such cases, the Engineer may permit portions of material to remain in the trench.
 2. Open Cut:
 - a. Excavate for utilities by open cut, except where installation by directional borings are noted otherwise on the Drawings.
 - b. If conditions at the site prevent such open cut and if approved by the Engineer, trenching may be used.
 - c. Short sections of a trench may be tunneled if, in the opinion of the Engineer, the conductor may be installed safely and backfill can be compacted properly into such tunnel.
 - d. Where it becomes necessary to excavate beyond the limits of normal excavation lines in order to remove boulders or other interfering objects, backfill the voids remaining after removal of the objects as directed by the Engineer.

- e. When the void is below the subgrade for the utility bedding, use suitable earth materials and compact to the relative density directed by the Engineer, but in no case to a relative density less than 90 percent.
- f. When the void is in the side of the utility trench or open cut, use suitable earth or sand compacted or consolidated, as approved by the Engineer, but in no case to a relative density less than 80 percent.
- g. Remove boulders and other interfering objects, and backfill voids left by such removal at no additional cost to the Contracting Authority.
- h. Excavating for Appurtenances:
 - 1) Excavate for manholes and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.
 - 2) Overdepth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel, or lean concrete as directed by the Engineer, and at no additional cost to the Contracting Authority.
- 3. Trench to the minimum width necessary for proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing for the utility.
- 4. Depressions:
 - a. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.
 - b. Except where rock is encountered, do not excavate below the depth indicated or specified.
 - c. Where rock is encountered, excavate rock to a minimum overdepth of 4" below the trench depth indicated or specified.
- 5. Where utility runs traverse public property or are subject to governmental or utility company jurisdiction, provide depth, bedding, cover, and other requirements as set forth by legally constituted authority having jurisdiction, but in no case less than the depth shown in the contract documents.
- 6. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace the turn upon completion of the backfilling.
- 7. Cover:
 - a. Provide minimum trench depth indicated below to maintain a minimum cover over the top of the installed item below the finish grade or subgrade.
 - 1) Areas subject to vehicular traffic:
 - a) As shown on the Drawings.
 - 2) Areas not subject to vehicular traffic:
 - a) As shown on the Drawings.
 - 3) All areas:
 - a) Gas Lines – as shown on the Drawings.

G. Backfilling:

- 1. General:
 - a. Except as otherwise specified or directed by special conditions, backfill trenches to the ground surface with selected material approved by the Engineer.

- b. Re-open trenches which have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified, or otherwise correct, to the approval of the Engineer.
- 2. Lower Portion of Trench:
 - a. Deposit approved backfill and bedding material in layers of 6" maximum thickness, and compact with suitable tampers to the density of the adjacent soil or grade, as specified herein, until there is a cover of not less than 12" over utility lines.
 - b. Take special care in backfilling and bedding operations to not damage pipe and pipe coatings.
- 3. Remainder of Trench:
 - a. Except for special materials for pavements, backfill the remainder of the trench with material free from stones larger than 6" or half the layered thickness, whichever is smaller, in any dimension.
 - b. Deposit backfill material in layers not exceeding the thickness specified, and compact each layer to the minimum density directed by the construction soil engineer.
- 4. Adjacent to Buildings: Mechanically compact backfill within 10' of buildings.
- 5. Under or Within 5' of Pavement: Backfill shall be granular material mechanically compacted.
- 6. Consolidation of backfill by jetting with water may be permitted, when specifically approved by the Engineer, in areas other than building and pavement areas.

3.02 FIELD QUALITY CONTROL

- A. The Engineer will inspect open cuts and trenches before installation of utilities, and will make the following tests:
 - 1. Assure the trenches are not backfilled until all tests have been completed.
 - 2. Check backfilling for proper layer thickness and compaction.
 - 3. Verify that test results conform to the specified requirements, and that sufficient tests are performed.
 - 4. Assure that defective work is removed and properly replaced.

3.03 CLEAN UP/ACCEPTANCE

- A. Protect newly graded areas from traffic and erosion, and keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded and rutted areas to the specified tolerances.
- C. Keep all travel routes free of tracked or spilled materials.

END OF SECTION

DIVISION 32

**EXTERIOR
IMPROVEMENTS**

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Division 00 – Procurement and Contracting Requirements and all provisions of Division 01 - General Requirements, apply to this Section.
- B. Section Includes:
 - 1. Fence fabric, posts and related items
 - 2. Excavation for fence posts
 - 3. Gates and related hardware

1.02 SUBMITTALS

- A. Product Data: Required. Include material descriptions, dimensions of individual components and profiles, and finishes for chain link fences and gates.
- B. Shop Drawings Required:
 - 1. Indicate plan layout, spacing of components, accessories, filaments, and anchorage.
 - 2. Submit manufacturer's installation instructions and procedures, including standard details of fence and gate installation.
- C. Samples: Required, see Item 2.02 MATERIALS for selection
 - 1. Fabric colors for selection or approval of Architect.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. A90/A90M, *Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc Alloy Coatings*
 - 2. A 370, *Mechanical Testing of Steel Products*
 - 3. A 392, *Zinc-Coated Steel Chain Link Fence Fabric*
 - 4. F 668, *Polyvinyl Chloride (PVC)-Coated Steel Chain Link Fence Fabric*
 - 5. F 934, *Standard Colors for Polymer Coated Chain Link Fence Materials*
 - 6. F 1043, *Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework*
 - 7. F 1664, *Standard Specification for Polyvinyl Chloride(PVC)-Coated Steel Tension Wire Used with Chain Link-Fence*

- B. Chain Link Fence Manufacturers Institute (CLFMI)

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable manufacturers, subject to compliance with Project requirements:
Master Halco, Inc., Richard's Fence, General Wire and Supply Co., or approved equal.

2.02 MATERIALS

- A. Polyvinyl Chloride (PVC)-Coated Steel Chain Link Fence System:
1. Height: As indicated on drawings.
 2. Fabric: 2" mesh, 9 ga. wire, with turn down knuckled and knubled
 3. Top Rail: 1-5/8" O.D. pipe
 4. Bottom Tension Wire: 7 ga.
 5. Line Posts: 2" O.D. pipe, Schedule 40
 6. End, Corner, Gate, and Pull Posts: 3" O.D. pipe, Schedule 40
 7. Finish:
 - a. Fabric: 2.0 oz. zinc coated as per ASTM A 392 or if noted on the drawings, 6 ga. bonded PVC coating in color as selected by the Architect, if not indicated on the drawings.
 - b. All other components: Finished to match fabric
 8. Gates: Frame 2" O.D. pipe welded at corners. Gate shall have a positive, automatic type latching device operative from both sides of gate with provision for padlocking.
 - a. Padlock: N.I.C.
 - b. Hinges sized to gate size and shall permit 180° swing.
 - c. Vehicle gates shall have automatic keepers which engage each gate leaf and holds it until manually released.
 9. Provide all accessories and hardware required for a complete installation.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Each post shall be anchored as indicated on drawings.
- B. Line posts shall be maximum 10 feet on center.
- C. Provide large gate swing posts as per standards for all gates over 7' - 0" in width.

- D. Top rails shall pass through intermediate post tops and form a continuous brace within each stretch of fence and be securely fastened to terminal posts.
 - 1. Pipe posts shall have tops that exclude moisture.
- E. End, corner, pull and gate posts shall be braced with the same material as the top rail and trussed to line posts with 3/8" rods and tighteners.
- F. Fabric shall be connected:
 - 1. To line posts every 14"
 - 2. To top rail every 24"
 - 3. To end, corner and gate posts by using tension bars connected to the post every 14" with steel bands with bolts and nuts
 - 4. To tension wire with hog rings every 24"

3.02 CLEAN UP/ACCEPTANCE

- A. Adjust gate and hardware to operate freely and properly.

END OF SECTION

SECTION 32 31 19

DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Division 00 – Procurement and Contracting Requirements and all provisions of Division 01 - General Requirements, apply to this Section.
- B. Section Includes:
 - 1. Metal fence pickets, rails, posts, and related accessories
 - 2. Finishing for metal fencing and gates
 - 3. Gates and related hardware

1.02 SUBMITTALS

- A. Product Data: Required. Include material descriptions, dimensions of individual components, and finishes for metal fence and gate(s).
- B. Shop Drawings Required:
 - 1. Indicate plan layout, spacing of components, accessories, and anchorage.
 - 2. Provide complete detailing of fabrication and installation including all anchorage and accessory items. Provide required templates for anchors and bolts specified for installation under other sections.
 - 3. Where metal fencing and gates are specified or required by code to comply with design loading, the shop drawings and structural calculations necessary shall be certified by a Licensed Professional Engineer.
- C. Finishing:
 - 1. Product Data: Manufacturer's data sheets on each paint and coating product, including the following:
 - a. Product characteristics
 - b. Surface preparation instructions and recommendations
 - c. Primer requirements and finish specification
 - d. Storage and handling requirements and recommendations
 - e. Application methods
 - f. Cautions, VOC's
 - 2. Color, if not indicated on the Drawings, will be selected by the Architect and submitted to the Contractor in scheduled form.

1.03 REFERENCES

- A. American Welding Society (AWS): *Structural Welding Code*
- B. ASTM International (ASTM):
 - 1. ASTM A36, *Standard Specification for Carbon Structural Steel*
 - 2. ASTM A47, *Standard Specification for Ferritic Malleable Iron Castings*
 - 3. ASTM A53, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*
 - 4. ASTM A123, *Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products*
 - 5. ASTM A153, *Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*
 - 6. ASTM A385, *Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)*
 - 7. ASTM A500, *Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes*
 - 8. ASTM A992, *Standard Specification for Structural Steel Shapes*

1.04 SYSTEM DESCRIPTION

- A. Structural Requirements: Design, engineer, fabricate and install metal fencing and gates to withstand acceptable standard, code required and/or prescribed structural loads without exceeding the allowable working stress of materials involved, anchors and connections. Apply each loading to each member to produce maximum stress in each fabrication component. Provide Certified Licensed Engineer (licensed by the State authorities where the project is located) Calculations and data, if requested.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide new metal, of the best commercial quality for the purpose intended, free from defects impairing strength, durability and appearance. Conform to the following standards for miscellaneous structural steel framing and miscellaneous non-structural steel:
 - 1. Structural Tube Columns: ASTM A500, Grade B
 - 2. Pipe: ASTM A53, Type S, Grade B
 - 3. Other Structural Steel: ASTM A36
 - 4. Malleable Iron Castings: ASTM A47
 - 5. Fasteners: Bolts, nuts, washers and other fasteners shall conform to the appropriate Federal Specifications.
- B. Gates: Gate shall have a positive, automatic type latching device operative from both sides of gate with provision for padlocking.
 - 1. Padlock: N.I.C.
 - 2. Hinges shall be gravity hinges sized to gate size and shall permit 180° swing.

- C. Miscellaneous Materials:
 - 1. Cold Galvanizing: Welco Cold Galvanizing, by Welco.
 - 2. Non-shrink Grout: Euco N-S Grout, by Euclid.
- D. Provide all accessories and hardware required for a complete installation.
- E. Finishing: Product names and numbers identified below reference Sherwin Williams (S-W) products. Other acceptable paint manufacturers, subject to compliance with the Project requirements, include: Pratt & Lambert, Benjamin Moore, Devco, PPG, Mautz, Hirshfield, or approved equal. Colors and finish as selected by Architect, if not indicated on the Drawings.
 - 1. Metal- Ferrous or Galvanized: High Gloss Latex Enamel
 - a. Touch up - S-W DTM Acrylic Primer/Finish
 - b. 2 Coats – S-W SuperPaint Exterior High Gloss Latex Enamel, A85 Series

PART 3 EXECUTION

3.01 INSTALLATION

- A. Space posts uniformly unless otherwise indicated.
- B. Posts shall be surface mounted as indicated on drawings.
- C. Check each post for vertical and top alignment, and maintain in position during placement and finishing operation.
- D. Install gates, if/where required, plumb, level, and secure for full opening without interference.

3.02 FINISHING

- A. Workmanship: Workmanship shall be of the very best. All materials evenly spread and smoothly flowed on, giving a uniform sheen and color without runs and sags. Transparent finishes shall have all coats brushed out smooth. Only skilled mechanics shall be employed and all materials shall be applied in strict accordance with manufacturer's directions. Except as otherwise specified, only one manufacturer's materials shall be used in each of the finishes specified
- B. Application:
 - 1. Apply all coatings and materials according to the manufacturer's printed recommendations.
 - 2. Do not apply to wet or damp surfaces.

3. Do no exterior painting below 50° F temperature.
4. Paint all exposed surfaces of every member. Paint anything inaccessible after installation before installation, if required to be painted.
 - a. Apply coatings using methods recommended by manufacturer.
 - b. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.
 - c. Apply coatings at spreading rate required to achieve the manufacturer's recommended dry film thickness.
5. Apply all coatings without reduction except as specifically required by label directions, or required by this specification. In such cases, reduction shall be the minimum permitted.
6. Thoroughly cover with uniform color and finish, as necessary for a complete hide, the number of coats specified being a minimum. Undercoats shall be colored to approximately match the final color.

3.03 CLEAN UP/ACCEPTANCE

- A. Clean up debris and unused material, and remove from site.
- B. Final Touch-up:
 1. Where coverage is incomplete or not uniform, as determined by the Architect, provide additional coats at no additional cost to the Owner.
 2. Touch-up damaged coatings after Substantial Completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

END OF SECTION

SECTION 32 31 29

WOOD FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Division 00 – Procurement and Contracting Requirements and all provisions of Division 01 - General Requirements, apply to this Section.
- B. Section Includes:
 - 1. Wood fence pickets, rails, posts and related accessories
 - 2. Excavation for fence posts
 - 3. Gates and related hardware
- C. Related Sections
 - 1. Section 03 30 00 – Cast-In-Place Concrete: Concrete fill for post holes

1.02 SUBMITTALS

- A. Product Data: Required. Include material descriptions and dimensions of individual components for wood fences.
- B. Shop Drawings Required:
 - 1. Indicate plan layout, spacing of components, accessories, and anchorage.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Western Red Cedar Fence System:
 - 1. Height: As indicated on drawings.
 - 2. Slats: Dog-eared slats, Shadow-box construction
 - 3. Top, bottom, and intermediate rails: 2x4 cedar
 - 4. Corner, gate, end, and/or line posts: 4x4 cedar
 - 5. Gates: Gate shall have a positive, automatic type latching device operative from both sides of gate with provision for padlocking.
 - a. Padlock: N.I.C.
 - b. Hinges sized to gate size and shall permit 180° swing.
 - 6. Provide all accessories and hardware required for a complete installation.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Space posts uniformly at 8'-0" o.c. unless otherwise indicated.
- B. Concrete set posts: Drill hole in firm, undisturbed or compacted soil. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post depth as indicated on drawings. Place concrete around post in a continuous pour. Trowel finish around posts and slope to direct water away from posts.
- C. Check each post for vertical and top alignment, and maintain in position during placement and finishing operation.
- D. Install gates, if/where required, plumb, level, and secure for full opening without interference.

3.02 CLEAN UP/ACCEPTANCE

- A. Clean up debris and unused material, and remove from site.

END OF SECTION

SECTION 32 90 00

PLANTING, TURF, AND GRASSES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of English Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Lawn - sodden and/or seeding:
 - a. Restore all lawns damaged as a result of completing the construction of this project, including at edges of paved areas.
 - 2. Plantings as per schedule on drawings.
 - a. Layout as per site plan.
 - 3. Bark mulch
 - 4. Rock Mulch
 - 5. Fabric liner
 - 6. Metal edging
 - 7. Excavation for trees and/or plants.
 - 8. Additional topsoil and placing of same for trees and/or plants.

1.02 WARRANTIES, GUARANTEES

- A. Guarantee: All plantings and seeding shall be guaranteed for one year (365 days) from acceptance of project by Owner. Replacement:
 - 1. Remove and replace any plant or seeding (as noted above) that is found dead or not in satisfactory growth.
 - 2. Replacement plants shall be same kind and size as specified for original plants.
 - 3. Cost of replacements shall be at expense of Contractor, except replacement required due to loss or damage due to occupancy of the project, vandalism or acts of neglect on the part of others during the guarantee period, after acceptance. Replacement plants shall be further guaranteed for another year from replacement.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil: Natural, friable, fertile, native peat loam possessing the characteristics of representative topsoil in the vicinity which produces heavy growths of vegetation.
 - 1. Topsoil shall be free from subsoil, noxious weeds, sticks, roots, stones, lime, concrete, ashes, slag or other deleterious matter, and shall be well drained in its original condition and free of toxic quantities of acid or alkaline elements.
 - 2. Contractor to add topsoil to areas receiving seeding as necessary.

- B. Sod: 1 ½" thick free from stones, dandelions, crab grass and weeds. Height of grass when sod is obtained shall not exceed 3". No peat grown sod permitted.
- C. Plant Material:
1. Names and Grades: Plant material shall conform to nomenclature of "Standardized Plant Names" as adopted by the Joint Committee of Horticulture Nomenclature, latest edition. Size and grading standards shall conform to the American Association of Nurserymen, Inc., as published in *American Standard for Nursery Stocks* latest edition. No substitutions of size or grade shall be permitted without written permission of the Engineer. Each bundle of plants and all separate plants, shall be properly identified with legible waterproof tag securely fastened to each plant or bundle of plants.
 2. Plant Schedule: See drawings. The height and caliper of the trees, the height or spread of shrubs, the diameter of the balls of roots are the minimum dimensions required. Plants indicated "B&B" are to be dug with a ball of earth and wrapped in burlap.
 3. Form: Well formed for the species or variety. Trees shall have single trunks, unless clump form is specified. Crotches shall be sound and unsplit.
 4. Digging and Handling: All precautions customary in good trade practice shall be taken in preparing plants for transplanting, in accordance with the *American Standard for Nursery Stock*, latest edition. Workmanship that fails to meet the highest standards will be rejected.
 5. Health: All plants including their roots shall be free from disease, insects or other injurious qualities. Contractor shall comply with all local, states, and federal laws pertaining to the inspection, sale, and shipment of plant materials. The trunk bark of all trees shall be sound. Trees shall have no large wound, and any small wound shall have a satisfactory callus roll formed or forming over them. Plants shall show good annual growth. Buds shall be plump and well filled for the species. Evergreen foliage shall be of good intense color. All plants shall be nursery grown except those trees and shrubs existing on the site that are transplantable. They shall have been growing in similar climatic conditions as the location of the project for at least two years prior to the date of this contract.
 6. Ball and Burlap: All balled and burlapped plants shall conform to the *American Standard for Nursery Stock* latest edition. All balls shall be of natural earth in which the plant has been growing. No manufactured or artificially produced or mudded-in balls shall be accepted. Balls shall be firm and unbroken and of large enough size to adequately enclose the plant's fibrous root system. Balled and burlapped plants may be rejected due to their failure to meet good digging practices.
- D. Water: Clean, free from deleterious substances.
- E. Grass Seed: Seed mix shall be for urban areas as specified in Article 2601.04, Paragraph C, of the Iowa DOT English Standard Specifications.

- F. Landscape Edging: All edging shall be 3/16" x 4" steel (Black) complete with anchor stakes.
- G. Bark Mulch: Commercially or locally processed cedar mulch, shavings, or ground bark free of growth or germination inhibiting ingredients. Mulch to be placed at a minimum of 4" depth.
- H. Rock Mulch: River rock shall be earth tones, minimum ¾" size. Place at a minimum depth of 3".
- I. Fabric Liner: Duon or equivalent landscape fabric.

PART 3 EXECUTION

3.01 INSTALLATION

- A. All planting shall be done in accordance with Section 2610 and articles of the Iowa DOT English Standard Specifications as stated below:
 - 1. Shrub Planting:
 - a. Layout: All shrubs shall be located as designated on the contract drawings and as directed by the Engineer. Where below ground or overhead obstructions are encountered, the shrubs shall be relocated as directed by Engineer.
 - b. Planting Pits: Shall be in accordance with Article 2610.03.
 - c. Setting of Shrubs: Shall be in accordance with Article 2610.03.
 - d. Pruning: Shall be in accordance with Article 2610.03.
 - e. Maintenance:
 - 1) The Contractor shall be required to make periodic checks on the total project to make certain that the materials are properly watered, cultivated, pruned and that all trees and evergreens are standing plumb, straightening those that are leaning, and that the sum of all conditions are contributing to the satisfactory progress of the materials, until such time as the work is approved by the Engineer and accepted by the Owner.
 - 2. Seeding:
 - a. Seed shall be applied to all disturbed areas not noted for sod, site improvements or landscaping.
 - b. Seeding shall be applied in accordance with Article 2601.04.
 - 3. Mulch Beds Over Liner:
 - a. Install edgings to locations shown on drawings to provide a uniformly level and in line edge.
 - b. All areas as shown on plans where seed or sod and mulch beds touch shall have steel edging installed.

- c. All planting beds or bufferstrips shall receive mulch over a liner unless indicated otherwise on plans. Place liner on subgrade at depth shown. Lap joints 2". If liner is non-perforated type, puncture at approximately 6" centers both directions, holes not to exceed 1/8" diameter.
 - d. Place mulch to uniform 4" depth for hardwood mulch and 3" for rock mulch if not otherwise indicated and flush with edging top.
- 4. Maintenance:
 - a. Commence immediately after each portion of lawn or planting is completed.
 - b. Maintain new plantings and water, mow and replant lawns to establish uniform turf until acceptance of project by Owner. Maintain watering for two weeks minimum regardless of project acceptance date.
 - c. Scattered bare spots in lawn no larger than 1 square foot each will be acceptable up to 3 percent of lawn area.
 - d. Repair any damage resulting from planting operations.

3.02 CLEAN-UP/ACCEPTANCE

- A. Protect/Clean
 - 1. Protect adjoining pavements, walks, structures from dirt and staining during completion of work. Cleaning of same is required.
 - 2. Leave site free of debris from this Section of Work.
 - 3. All ground areas disturbed as a result of planting operations shall be restored to their original condition or to the desired new appearance.
 - 4. Protect completed landscaping from any damage until project is accepted by Owner.

END OF SECTION

Introductory Information

**PROJECT MANUAL FOR:
CONTRACT 233AG
REST AREA STANDBY GENERATORS
CEDAR COUNTY REST AREA
EAST BOUND AND WEST BOUND
PROJECT NO. IMN-80-8(260)269--0E-16**

CERTIFICATION

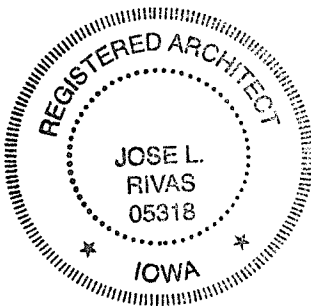
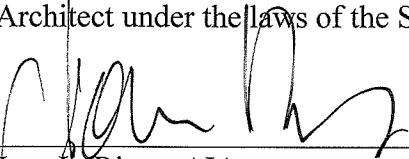
PROJECT

IDOT 233AG
Rest Area Standby Generators

ARCHITECT

Yaggy Colby Associates
Mason City, Iowa and
717 Third Avenue SE
Rochester, MN 55904



Telephone: (507) 288-6464
Fax: (507) 288-5058

<p>(SEAL)</p> 	<p>I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly registered Architect under the laws of the State of Iowa.</p> <p> <u>5/21/09</u> Jose L. Rivas, AIA (Date) License #05318</p> <p>My License renewal date is 06/30/11</p> <p>Pages or sheets covered by this seal: Division 03.</p>
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LANDSCAPE ARCHITECT

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<p>(SEAL)</p> 	<p>I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly registered Landscape Architect under the laws of the State of Iowa.</p> <p> <u>5/21/09</u> _____ Monte A. Appelgate, ASLA (Date) License #342</p> <p>My License renewal date is 06/30/10</p> <p>Pages or sheets covered by this seal: Division 32.</p>
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CIVIL ENGINEER

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(SEAL)



I hereby certify that this engineering document was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Iowa.

David H. Fredericks 5/21/09
David H. Fredericks, PE (Date)
License #9336


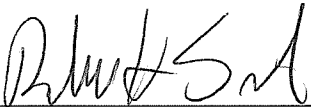
My License renewal date is 12/31/09

Pages or sheets covered by this seal: Divisions 02 and 31.

MECHANICAL/ELECTRICAL ENGINEER

Brown Engineering Company
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<p>(SEAL)</p> 	<p>I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.</p> <p> Robert H. Sieh, PE License #15377</p> <p>5-21-09 (Date)</p> <p>My license renewal date is 12/31/09</p> <p>Pages or sheets covered by this seal: Division 26.</p>
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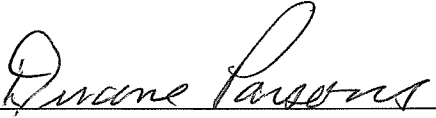
<p>(SEAL)</p> 	<p>I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.</p> <p> Duane P. Parson, PE License #10520</p> <p>5/21/09 (Date)</p> <p>My license renewal date is 12/31/09</p> <p>Pages or sheets covered by this seal: Division 23.</p>
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DIVISION 02

EXISTING CONDITIONS

SECTION 02 01 00

MAINTENANCE OF EXISTING CONDITIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Maintain operation of existing rest area facilities, sidewalks, and utility services.
 - 2. Contractor shall notify the Iowa DOT, Division of Maintenance Services, 24 hours (minimum) in advance of when he plans to be on-site and performing work.
- C. Related Sections of Work;
 - 1. Demolition: Section 02 41 00

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide all barricades, fences, and warning lights as required to protect persons and property in accordance with all applicable Iowa DOT specifications and regulations.

PART 3 EXECUTION

3.01 INSPECTION

- A. Locate existing utilities in areas of work before starting operations under this section. Use all means necessary to provide protection from damage during construction operations.
- B. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Engineer immediately for directions as to procedure. Cooperate with Owner and public and private utility companies in keeping services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

3.02 PROCEDURE

- A. Maintaining Traffic:
 - 1. Ensure minimum interference with roads, driveways, sidewalks, and adjacent facilities.

2. Do not close or obstruct roads, driveways, and sidewalks without permission from authorities having jurisdiction.
3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

B. Maintaining Utilities:

1. LP Gas Service and electrical service are essential to the operations of the rest area.
 - a. It will be necessary to shut down these services during construction. These shut downs shall be limited to two (2) hours per occurrence.
 - b. Contractor shall notify the Iowa DOT, Division of Maintenance Services, 48 hours (minimum) in advance of shutting down these services.

END OF SECTION

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Remove existing landscaping as indicated.
 - 2. Remove existing PCC sidewalk as indicated.
 - 3. Remove/abandon existing utilities as indicated.
- C. Related Sections and Work:
 - 1. Excavating, Stripping Topsoil, Filling, Grade: Division 31.
 - 2. Capping of Mechanical and Electrical Items: Divisions 23 and 26 – coordinate the proper local utility.

1.02 PROTECTION

- A. All remaining portions of property and utilities not scheduled for demolition shall be completely protected during demolition and removal of debris. Any resulting damage shall be repaired or replaced to like new condition by the Contractor responsible.

1.03 OCCUPANCY

- A. The rest area facilities shall remain open at all times.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide all barricades, fences, and warning lights as required to protect persons and property in accordance with all applicable Iowa DOT Specifications and regulations.

PART 3 EXECUTION

3.01 INSPECTION

- A. Prior to commencing the work installed under this section, examine the areas and conditions under which the work of this section will be performed. Notify the Engineer, in writing, of unacceptable conditions that exist, prior to acceptance.

3.02 CLEARING/PROCEDURE

- A. In all activities, comply with pertinent regulations of governmental agencies having jurisdictions.
- B. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- C. Demolition construction to be removed:
 - 1. Demolish completely and remove from the site.
 - 2. Use such methods as required to complete the work within the limitations of governing regulations.
 - 3. Break up and remove concrete slabs on grade as noted on drawings.
 - 4. Pollution Control:
 - a. Provide water sprinkling, temporary enclosures and other suitable methods as may be required to limit the amount of dust and dirt rising and scattering in the air to the lowest level of air pollution practical for the work conditions.
 - b. Comply with all governing regulations.
 - c. Clean adjacent structures and other improvements of all dust, dirt, and debris caused by demolition operations as directed by the Engineer.
 - d. Return all areas to conditions existing prior to start of the work of this section.
- D. Disposal of Materials:
 - 1. No demolition material is scheduled for reuse.
 - 2. All demolition material shall become property of the Contractor and shall be removed from the Owner's site by the Contractor. No prolonged accumulation of debris will be allowed.
 - a. Remove all demolition material from the site as removed. Storage or sale of removed items on the site will not be allowed.

3.03 CLEAN UP/ACCEPTANCE

- A. Clean up trash and debris caused by clearing operations under this section, keeping premises clean and neat at all times.

END OF SECTION

DIVISION 03

CONCRETE

SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Provide formwork for all cast-in-place concrete including formwork for concrete bases for equipment of mechanical and electrical divisions, if applicable. Contractors for Divisions 21, 22, 23, and 26 shall be responsible for size, location and required inserts.
 - 2. Install all inserts, sleeves, bolts and similar items required for the work of other sections.

1.02 RELATED SECTIONS AND WORK

- A. Furnishing of inserts, sleeves, bolts and similar items of other sections which are built into the work of this section.
- B. Exterior concrete pads for mechanical and electrical equipment: Respective Divisions 21, 22, 23, and 26.

1.03 QUALITY ASSURANCE

- A. American Concrete Institute (ACI)
 - 1. ACI 347, Recommended Practice for Concrete Formwork.
 - 2. ACI 301, Specifications for Structural Concrete for Buildings
 - a. Tolerances are not cumulative, 1/8" max.
 - 3. ACI 318 - Building Code requirements for Reinforced Concrete.
 - 4. PS 1 - Construction and Industrial Plywood.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Removable Forms:
 - 1. Forms for Exposed Finish Concrete: Unless otherwise shown or specified, construct formwork for concrete surfaces, which will be exposed to view in the completed project, with plastic coated plywood, metal, metal-framed plastic coated plywood or other acceptable panel-type materials, to provide continuous,

straight, smooth exposed surfaces. Furnish in largest practicable sizes to minimize number of joints.

- a. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
2. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed to view in the completed project with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
3. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces to be cured with water or curing compound.

B. Embedded Items, Accessories:

1. All anchor bolts, inserts, plates, angles, sleeves, nailing blocks, etc., whether furnished as specified under this division, or other divisions, furnished by other trades or by the Owner shall be installed by this Contractor. Anchor bolts, unless specifically furnished by others, will be furnished by this Contractor. Suitable templates will be constructed and used to accurately set and support against displacement all bolts, inserts, sleeves, etc.
2. Conduits and Pipes: This Contractor shall be responsible for controlling the proper placing of all embedded pipe, conduit and other fixtures. ACI 318, Article 6.3 shall apply to all cause of embedded fixtures.
3. Corner Formers: Provide 45 degrees corner formers (chamfer) on all exposed external corners and exposed edges in the final project.

C. Form Ties:

1. For unexposed concrete: Adjustable length removable or snap-off type which will leave holes no larger than 1" in diameter in face of concrete and when forms are removed no metal will be within 1" of finished concrete surface.
2. For exposed concrete:
 - a. Cone type, length and size required, with removable plastic cone, which when removed will leave clean, neat hole 1" dia. and approximately 1 1/2" deep.
3. No wire ties or site fabricated ties permitted.

PART 3 EXECUTION

3.01 INSTALLATION

A. Form Construction:

1. General: Construct forms complying with ACI 347, to the exact sizes, shapes, lines and dimensions shown and as required to obtain accurate alignment, location, grades, level and plumb work in the finished structures.
2. Design, engineering and proper construction of forms, shoring and bracing is the responsibility of the Contractor. Include all factors pertaining to safety of

formwork structure such as live load, dead load, weight of equipment on formwork, concrete mix, height of concrete drop, vibration reactions and similar factors.

3. Construct formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.
4. Construct formwork, brace, shore, tie forms to maintain position and shape true and straight without deflection.
5. Coat forms in accordance with manufacturer's recommendations to provide for removal of forms without damaging surface of finished concrete prior to placing reinforcement.
 - a. Do not coat construction joints.
 - b. Excess coating material shall not be allowed to stand in puddles in the forms nor allowed to come in contact with concrete against which fresh concrete will be placed.
 - c. Do not coat permanent forms.

B. Earth Forms:

1. Side forms for footings may be omitted and concrete may be placed directly against excavation, only when requested by the Contractor and approved in writing by the Engineer.
2. When omission of forms is accepted, provide additional concrete 1" on each side of the minimum design profiles and dimensions shown on the drawings.

C. Removal of Forms:

1. Remove forms in a manner and at such time to insure complete safety of the structure. In no case shall supporting forms or shoring be removed until sufficient strength has been obtained to support weight and load.
 - a. Results of job-cured cylinders (ASTM C 31) shall be used as evidence that concrete has obtained required strength.
2. Remove in manner that will not damage concrete or adversely affect appearance of exposed concrete members.
3. Coordinate removal with work of other trades.
4. Completely remove all wall ties, leaving clean cut holes without disfigurement of concrete.

D. Tolerances: Tolerances for construction of cast-in-place concrete work shall be as follows:

1. General: Tolerances of any kind permitted in construction shall not relieve the Contractor of providing the design indicated or fitting the different materials together properly for continuity of construction, proper function of building.
2. Footings:
 - a. Variation of dimensions in plan: +2", -1/2"
 - b. Variation of center from specified center in plan: 2 percent of footing width in direction of variation, plus or minus 2" maximum variation.
 - c. Variation of bearing surface from specified elevation: plus or minus 1/2".
3. Piers, Columns and Walls:

- a. Variation in cross-sectional dimensions of piers and columns and in thickness of walls: plus or minus 1/4".
- b. Variation in plan from specified location in plan: plus or minus 1/2" any member, any location.
- c. Deviation in plan from straight lines parallel to specified linear building lines.
 - 1) 1/40" per foot, adjacent members less than 20' apart or any wall length less than 20'.
 - 2) 1/2" adjacent members 20' or more apart or any wall length of 20'.
- d. Deviation from Plumb:
 - 1) 1/4" any 10' of height.
 - 2) 1" maximum for the entire height.
- e. Variation in elevation from specified elevation: plus or minus 1/2", any member, any location.
- f. Deviation in elevation from lines parallel to specified grade lines.
 - 1) 1/40" per foot, adjacent members less than 20' apart or any wall length less than 20'.
 - 2) 1/2" adjacent members 20' or more apart or any wall length of 20'.
- 4. Anchor Bolts and Sleeves:
 - a. Variation from specified location in plan: plus or minus 1/4".
 - b. Variation from specified elevation: plus or minus 1/2".
- 5. Deviation from Drainage (Pitch) Slope:
 - a. Tolerances of any kind permitted in construction shall not relieve the Contractor of providing uniform drainage pitch or slope (without areas that cause ponding) where indicated by note, elevation differences or design.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Fabrication and Placement of Reinforcement For:
 - a. Cast-In-Place Concrete
 - b. Structural Concrete
 - c. Including bars, welded wire fabric, ties, supports and accessories required.
 - 2. Furnishing bars for reinforced masonry.
 - 3. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site.
 - 4. Contractor is responsible for the fabrication processes, techniques of construction, coordination of his work with that of all other trades, and the satisfactory performance of his work.

1.02 QUALITY ASSURANCE

- A. American Concrete Institute (ACI)
 - 1. ACI 318, Building Code Requirements for Reinforced Concrete.
- B. Concrete Reinforcing Steel Institute (CRSI), American Society for Testing and Materials (ASTM), American Welding Society (AWS), American National Standards Institute (ANSI).
 - 1. Manual of Standard Practice
 - 2. ACI 301 - Structural Concrete for Buildings
 - 3. ACI SP-66 - American Concrete Institute - Detailing Manual
 - 4. ANSI/ASTM A 82 - Cold Drawn Steel Wire for Concrete Reinforcement
 - 5. ANSI/ASTM A 185 - Welded Steel Wire Fabric for Concrete Reinforcement
 - 6. ANSI/ASTM A 497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement
 - 7. ANSI/AWS D 1.4 - Structural Welding Code for Reinforcing Steel
 - 8. ASTM A 615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement
 - 9. ASTM A 706 - Low Alloy Steel Deformed Bars for Concrete Reinforcement
 - 10. AWS D 12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction
 - 11. CRSI - Placing Reinforcing Bars

1.03 SUBMITTALS

- A. Shop Drawings: If required by Engineer.
 - 1. Submit complete shop and setting drawings. Include reinforcing for all concrete and masonry work.
 - 2. Show reinforcing size, length, bending details, spacing, and methods of supporting reinforcing. Provide details as necessary to show final position of reinforcement in elements. Show all walls in plan and elevation.
 - 3. Engineer's review of shop drawings will be for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Compliance with the requirements for materials, dimensions, fabrication, and erection is the Contractor's responsibility.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver all bars to job site, bundled in manageable units and properly tagged to permit inspection identification.
- B. Do not exceed capacity of existing construction or formwork.
- C. Store reinforcing clear of ground and avoid contact with mud, grease, or other materials which would affect bond.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Reinforcing Steel:
 - 1. All Reinforcing Bars: ASTM A 615, Grade 60, deformed as per ASTM specifications.
 - 2. Welded Smooth Wire Fabric: ASTM A 185 welded steel wire fabric for concrete reinforcement, size as noted on drawings. Minimum 6" x 6": 1.4W x 1.4W Welded Wire Fabric.
 - 3. Dowels: Plain round rolled steel bars, ASTM A 306, Grade 80.
- B. Accessories:
 - 1. Chairs and spacers: Metal stock designed for purpose intended.
 - 2. Comply with CRSI "Recommended Practice for Placing Bar Supports, Specifications and Nomenclature".
 - 3. Provide galvanized or plastic tipped accessories in contact with forms for sight exposed concrete; stainless steel accessories for sandblasted or bush-hammered concrete.
 - 4. Wire: Plain, cold-drawn steel wire, ASTM A 82.

2.02 FABRICATION

- A. General: Fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI Manual of Standard Practice. In case of fabricating errors, do not rebend or straighten reinforcement in a manner that will injure or weaken the material.
- B. Unacceptable Materials: Reinforcement with any of the following defects will not be permitted in the work:
 - 1. Bar lengths, depths and bends exceeding specified fabrication tolerances.
 - 2. Bend or kinks not indicated on drawings or final shop drawings.
 - 3. Bars with reduced cross-section due to excessive rusting or other cause.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Comply with the specified codes and standards and Concrete Reinforcing Steel Institute recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified and noted on the structural drawings.
 - 1. Clean reinforcement to remove loose rust and mill scale, earth, ice and other materials which reduce or destroy bond with concrete. Metal reinforcement with rust, mill scale or a combination of both shall be considered as satisfactory, provided the minimum dimensions, including height or deformations and weight of hand wire brushed test specimen, are not less than the applicable ASTM specification requirement.
 - 2. Position, support and secure reinforcement against displacement by formwork, construction or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.
 - 3. All splicing of bars, concrete cover, placing tolerances and bar spacings shall conform to Building Code Requirements for Reinforced Concrete (ACI 318), as published by the American Concrete Institute and to recommended practices in Reinforcing Bar Splices by the Concrete Reinforcing Steel Institute. Splices not detailed require approval of the Engineer prior to placing concrete.
 - 4. Place reinforcement to obtain the minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports together with 16 gauge wire to hold reinforcements accurately in position during concrete placement operations. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.
 - a. Protect reinforcement by concrete as follows unless otherwise detailed:
 - (1) Where concrete is exposed to weather or to ground, but placed in forms: not less than 2" for bars more than 5/8" diameter and 1 1/2" for bars 5/8" or less in diameter.
 - 1) Concrete covering or reinforcing in footings: 3" clear on bottom and sides.

- (2) All other concrete: cover reinforcement a minimum of 3/4" for slabs and walls and 1 1/2" from floor penetrations and beam faces.
- 5. Coordinate and cooperate with other trades to insure that all reinforcing is in proper place and that all pipes, sleeves, conduit, anchors, bolts, flashings, caulking grooves, slips and other inserts of other trades to be cast into concrete are securely placed before concrete is placed.
- 6. Install welded wire fabric in as long lengths as practicable, cut to fit all penetrations. Lap wire mesh in structural slabs so that full, uncut squares of mesh of both sheets lap each other at least 1 1/2 times or 12", whichever is greater. Lap wire mesh in slabs on grade and topping slabs so that full, uncut squares of mesh of both sheets lap each other at least 1/2 times or 6", whichever is greater. Lap splices with 16 gauge wire or clip together with standard metal clips. Place mat flat, without roll or curling.
 - a. Unless otherwise indicated, reinforce all concrete floor slabs, precast plank topping, concrete decks on permanent forms, walks, drives and all exterior slabs on grade with 6" x 6": 1.4W x 1.4W welded wire fabric.
- 7. Provide sufficient numbers of supports and of strength to carry reinforcement. Do not place reinforcing bars more than 2" beyond the last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.
- 8. No bars shall be placed while concrete is being poured.
- 9. No bars shall be bent after being partially embedded in hardened concrete.
- 10. No welding of reinforcing steel shall be permitted without prior written authorization by the Engineer.
- 11. Provide concrete masonry walls with full height vertical reinforcing where noted on plans.
 - a. Provide the same vertical reinforcement at all door jambs, corners, control joints and each side of columns.

3.02 FIELD QUALITY CONTROL

- A. Notify Engineer when reinforcing is in place so that a review of reinforcement placement can be made prior to placement of concrete.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Provide all cast-in-place concrete including masonry fill, setting of fence posts, and like items.
 - 2. Install anchor bolt inserts and similar items furnished by other trades.
 - 3. Contractor for this section of work shall coordinate all phases of the concrete work to completion.

1.02 RELATED SECTIONS

- A. Section 03 10 00 – Concrete Forming and Accessories
- B. Section 03 20 00 – Concrete Reinforcing
- C. Furnishing of anchor bolts, inserts and similar items required by other trades.
- D. Exterior (exterior only), concrete bases for equipment of mechanical and electrical – Divisions 21, 22, 23, and 26.

1.03 QUALITY ASSURANCE

- A. Reference Standards for Design and Construction
 - 1. American Concrete Institute (ACI)
 - a. ACI 301, 84, Specifications for Structural Concrete for Buildings
 - b. ACI 304, Concrete Placement
 - c. ACI 305, Recommended Practice for Hot Weather Concreting
 - d. ACI 306, Recommended Practice for Cold Weather Concreting
 - e. ACI 318, Building Code Requirements for Reinforced Concrete
 - 2. American Society for Testing and Materials (ASTM)
 - a. ASTM C 31, Making and Curing Concrete Test Specimens in the Field
 - b. ASTM C 33, Standard Specification for Concrete Aggregates
 - c. ASTM C 94, Standard Specification for Ready-Mixed Concrete
 - d. ASTM C 143, Test Method for Slump of Portland Cement Concrete
 - e. ASTM C 150, Standard Specification for Portland Cement

- f. ASTM C 171, Standard Specification for Sheet Materials for Curing Concrete.
 - g. ASTM C 260, Standard Specification for Air-Entrained Admixtures for Concrete.
 - h. ASTM C 309, Standard Specification for Liquid Membrane-Forming Compound for Curing Concrete.
 - i. ASTM C 330, Standard Specification for Lightweight Aggregates for Structural Concrete
 - j. ASTM C 494, Standard Specification for Chemical Admixtures for Concrete.
 - k. ASTM C 979, Standard Specification for Pigments for Integrally Colored Concrete.
- B. Other portions of this Section 03 30 00 contain requirements and information related to ACI Standards and ASTM Standards; in case of conflict between these standards and this section, the requirements of this Section 03 30 00 shall govern.
- C. Testing:
 - 1. See Article 1106.02, Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation.
 - 2. The concrete furnished under this section of work shall be the strength as indicated in PART 3 - EXECUTION and the tests listed in PART 3 - FIELD QUALITY CONTROL are required. These tests will be provided by the Owner.

1.04 SUBMITTALS

- A. Comply with requirements of field quality control testing listed in PART 3 - EXECUTION.
- B. Concrete Mix Design:
 - 1. General Requirements: The Contractor, at his expense, shall employ the services of an independent testing laboratory to test the proposed aggregate and design concrete mixes for each type of concrete required.
 - a. Submittal and approval of mix design: Aggregate test reports and mix design shall be submitted to the Engineer and structural engineer in duplicate for approval at least 14 days prior to placing of concrete. No concrete will be allowed to be placed until the aggregate test reports have been reviewed and mix designs approved by the Engineer.
 - b. Testing of Aggregate: Each type of fine course aggregate to be used shall be completely tested in accordance with the requirements of ASTM C 33, latest edition, and these specifications. Lightweight aggregate shall be tested in accordance with the requirements of ASTM C 330, latest edition.
 - c. Use of reports from other projects: Reports of tests made for other projects may be submitted; however, such tests shall be representative of

the aggregate to be furnished. If reports of tests made for other projects are submitted, the Contractor shall submit samples of each type of aggregate to be used to the laboratory and the following additional tests shall be made.

- 1) Gradation ASTM C 136-71 and C 117-69
 - 2) Organic Impurities ASTM C 40-73
 - 3) Friable Particles ASTM C 142-71
 - 4) Coal and Lignite ASTM C 123-69
- d. Submittal of Cement Samples: The Contractor shall also submit representative samples of each type of Portland Cement to the laboratory for use in preparation of mix designs.
- e. Design of Mixes: Design of mixes in accordance with ACI 301, Section 3.9. Base design on size of mixer, cement and aggregate to be used. Indicate cement factor, water-cement ratio and scale setting for mixer.
- f. Change of Aggregate: The approved mix design shall be used as long as aggregate characteristics remain unchanged. Upon significant changes in aggregate, prepare new mix designs.

1.05 WEATHER CONDITIONS

- A. Provide adequate protection against rain, sleet and snow before and during placement and finishing of concrete.
- B. Provide adequate protective measures to maintain the temperature of the concrete as specified.
- C. Keep a thermometer on the job site at all times to record temperature.
- D. At the time the concrete is poured the temperature of the forms and reinforcing steel shall not exceed the maximum or minimum temperatures specified for the concrete by more than 10° F.
- E. Use accelerating or retarding admixtures only in accord with recommendations of the testing laboratory and as approved by the Engineer.
- F. Do not allow CO₂ gases to contact freshly placed concrete. Repair or replace carbonized surfaces as directed by the Engineer.
- G. Cold Weather Concreting:
 - 1. Perform all cold weather concreting in accord with ACI 305 - "Recommended Practice for Cold Weather Concreting".
 - 2. Do not place concrete when the atmospheric temperature is below 40° F, or when the concrete is likely to be subjected to freezing temperatures within 24 hours after it has been deposited, unless adequate temporary

heating is provided. In no case shall concrete be exposed to freezing temperatures for 72 hours after placing.

3. Maintain concrete temperature not less than 50° F nor more than 90° F for the first three days after placing. Protect from freezing for the next five days.

H. Hot Weather Protection:

1. Perform all hot weather concreting in accord with ACI - 605 - "Recommended Practice for Hot Weather Concreting".
2. Thorough wet dry porous surfaces before concreting.
3. Maintain concrete temperature not less than 50° F no more than 90° F for the first three days after placing. Protect from temperatures over 90° F for the next five days.

PART 2 PRODUCTS

2.01 MATERIALS

A. All Concrete Materials shall be from Iowa Department of Transportation approved sources:

1. Portland Cement: ASTM C 150, Type 1
2. Aggregate:
 - a. Applicable Standard: ASTM C 33
 - b. Aggregate shall be hard-coated gravel or crushed stone, maximum size 1/5 narrowest dimension between reinforcing rods. Sizes as follows:
 - 1) Footing: 1 1/2" maximum
 - 2) Fill for masonry: 3/8" maximum
 - 3) All other concrete: 3/4" maximum
 - c. Sand: ASTM C 33, clean, hard uncoated grain, free from loam, clay and silt.
3. Water: Clean, potable and free of deleterious amounts of acids, alkalis and organic materials.

2.02 CONCRETE ADMIXTURES

A. All Concrete Admixtures shall be Iowa Department of Transportaion approved sources.

B. Air Entraining Admixtures: Use in all concrete exposed to the weather and as specified for quality of concrete used, ASTM C 260.

1. "Aerolith", Sonneborn Building Products, Inc.
2. "Sika-AEA", Sika Chemical Corp.
3. "Darex AEA", W. R. Grace and Company
4. Engineer approved equivalent

- C. Water Reducing Admixture: ASTM C 494, Type A, and not containing more chloride ions than municipal drinking water. Acceptable manufacturers:
 - 1. Euclid Chemical Company - Eucon WR-75
 - 2. Sika Chemical Corp. - Plastocrete 160
 - 3. Master Builders - Pozzoloth 200N
 - 4. Engineer approved equivalent
- D. Non-Chloride Accelerators: ASTM C 494, Type C or Type E, and not containing more chloride ions than municipal drinking water. Acceptable manufacturers:
 - 1. Sika Chemical Corp. - Sikacrete
 - 2. W. R. Grace - Darex Set Accelerator
 - 3. Master Builders - Pozzoloth 122-HE
 - 4. Engineer approved equivalent.
- E. Calcium chloride is prohibited
- F. Fly Ash: ASTM C 618 at Contractor's option

2.03 MISCELLANEOUS MATERIALS

- A. Liquid Curing and Sealing Compound: Acrylic base, ASTM C 309, Type I, containing a minimum of 18% solids.
 - 1. Performance Requirements:
 - a. Contains no wax, oils, salts or other ingredient that is detrimental to bonding concrete topping, sealants, resilient tile, paint or other specified finish being applied to concrete.
 - b. Contains no ingredient which stains or discolors concrete permanently.
 - 2. Acceptable Manufacturers:
 - a. Euclid Chemical Company - Rezseal
 - b. Sonneborn - Kur-N-Seal
 - c. Tamms Industries Co. - SC Seal Cure 18
 - d. Engineer approved equivalent
- B. Bonding Compound: Polyvinyl acetate, rewettable type.
 - 1. Acceptable manufacturers:
 - a. Euclid Chemical Company - Euco Weld
 - b. Tamms Industries Co. - Lab Liquid Adhesive Bond
 - c. L&M Construction Chemicals - Everweld
 - d. Engineer approved equivalent
- C. Expansion joint filler: Performed, resilient, non-extruding asphalt impregnated cane fiber conforming to ASTM D 1751, Exterior Use ASTM D 1752, Federal Specifications HH-F-341E, Type 1.

1. Size:
 - a. Use 1/4" thick x depth of slab for all interior slabs on grade (not exposed to the elements.)
 - b. Use 1/2" thick unless shown otherwise x depth of slab.
- D. Patching Concrete: Same materials and proportions as the concrete used except.
 1. Omit coarse aggregate.
 2. Use no more than one part cement to 2-1/2 parts sand by damp, loose volume.

2.04 FABRICATION

- A. Concrete Type and Strength: Concrete shall have a minimum compressive strength, in place, at 28-days as follows:
 1. Exterior concrete slabs on grade, footings, foundation walls, and retaining walls: 4,000 psi with entrained air.
 2. Masonry Fill/Grout: 2,000 psi
 3. Masonry Bond Beams: 3,000 psi
 4. All other Concrete: 3,000 psi
- B. Slump: Concrete slump be as determined by ASTM C 143 and shall be as follows:
 1. Slabs-on-Grade Foundation walls and retaining walls: 3" maximum.
 2. Footings: 3" to 4"
 3. Masonry fill/grout for reinforced cores and piers: 5" to 8"
- C. Water-Cement Ratio: All exterior concrete exposed to weather shall have a water-cement ratio of not more than 0.44. All other concrete shall have a maximum ratio of 0.53.
- D. High-Early Strength Concrete: Contractor may use Type III Portland Cement to produce high-early strength concrete. Adding additional amounts of Type I Portland Cement to product high-early strength concrete will not be permitted.
- E. Brand of Cement: Only one brand of Portland Cement shall be used. The same brand and type, normal or high-early strength, of Portland Cement shall be used for all concrete to have an architectural finish.
- F. Workability: Concrete consistency shall be such that concrete will fill forms without voids or honeycombs, completely embed and bond to reinforcing without permitting materials to separate, and not promote excess water to collect on surface.

G. Admixtures:

1. Entrained air: All exterior concrete exposed to weather shall be air-entrained. Proportions of entrained air, as determined by ASTM C 138, ASTM C 173 or ASTM C 231, shall be 5-7 percent by volume for concrete with 3/4" maximum nominal size coarse aggregate.
2. Water Reducing Admixture: Provide in all concrete.
3. Non-Corrosive Accelerator: Provide in concrete slabs placed when below 50° F.
4. Calcium Chloride: Not permitted
5. Fly Ash: ASTM C 618, Type C, Contractor's option per mix design. Not to exceed 15% by weight substitution for Portland Cement.

H. Concrete Mixing:

1. General: All concrete required shall be ready-mix concrete and shall be provided by an Iowa Department of Transportation approved ready-mix concrete facility.
2. Ready-Mixed Concrete:
 - a. Applicable Standard: Concrete shall be mixed and delivered in accordance with ASTM C 94.
 - b. Source: Source of ready-mix concrete shall be approved by Engineer.
 - c. Agitating: Agitate concrete materials continuously from time materials are placed in mixer until concrete is discharged.
 - d. Tempering: No additional water shall be added to mix after truck leaves batching plant without approval of Engineer.
 - e. Departure Certification: Each truck shall have time of departure from batching plant stamped on ticket.
 - f. Delivery Time: There shall be a maximum of 1-1/2 hours between time concrete mix is placed in truck and placing of concrete in forms. When air temperature is between 85° F and 90° F, maximum delivery time shall be 75 minutes. When air temperature is above 90° F, maximum delivery time shall be 60 minutes.

PART 3 EXECUTION

3.01 INSTALLATION

A. Preparation before Placing Concrete:

1. General: Before concrete placement, formwork shall be completed, elevations verified, slope or drainage verified, snow, ice and water and other debris shall be removed, reinforcement shall be secured in place, and expansion joint materials shall be positioned.
 - a. Preparation of Subgrades: Sprinkle semi-porous subgrades sufficiently to eliminate suction. Do not place concrete on frozen ground, on soft mud, or dry porous earth.

2. Cleaning Equipment: Remove hardened concrete and foreign materials from inner surface of conveying equipment.
3. Verify completion of all other work to be covered or enclosed by the concrete.

B. General:

1. Conveying Concrete: Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.
2. In joining fresh concrete to concrete that has already set, remove all loose and foreign materials from set concrete. Scrub with wire brooms and thoroughly clean. Moisturize when the new concrete is placed.
3. Exercise care in placement of concrete for slabs on grade over vapor barrier. Avoid puncturing or tearing vapor barrier during transportation and placement.

C. Placing Concrete:

1. Placing Exterior Slabs and Sidewalks:
 - a. Shelter Slabs Subgrade: Place shelter slabs on a minimum 12" thick compacted granular fill.
 - b. Thickness and reinforcing as shown on drawings.
 - 1) Minimum concrete (slab) thickness 6".
 - 2) Minimum reinforcing as indicated on Drawings.
 - c. Finish: Broomed finish unless otherwise indicated. After floating, troweling and when water sheen has disappeared, brush lightly with approved steel or fiber broom, to a uniform roughened surface. Brooming shall be at right angle to the centerline of walks and always in one direction of large continuous areas.
 - d. Expansion Joints: 1/2" pre-molded bituminous filler in locations detailed and at intervals not exceeding 30' in any direction.
 - e. Slope: Slope all exterior concrete slabs in a manner to prevent the collection of water.
 - f. Construction of Portland Cement Concrete sidewalks shall conform to Section 2511 of the Iowa DOT Standard Specifications.
 - g. Concrete shall be Class C concrete produced and placed in accordance with Section 2301 and Article 4115.04, Paragraph C, Iowa DOT Standard Specifications.
 - h. Course aggregate shall be Class 3i Durability.

- D. Consolidated Concrete:
1. General: Consolidate concrete by vibrating, spading, rodding or forking so that concrete is thoroughly worked around reinforcement, around embedded items, and into corners of forms to eliminate air or stone pockets which may cause honeycombing, pitting or planes of weakness. Use competent workmen under competent supervisors.
- E. Joints in Concrete:
1. Locate construction joints as indicated on drawings, or as approved by the Engineer.
 - a. Place joints perpendicular to the main reinforcement.
 - b. Refer to drawings for control and construction joints
 2. Expansion Joints: Refer to drawings and/or install whenever slabs abut vertical surfaces ACI 301.
 3. Contraction Joints: Refer to drawings for details and spacing notes.
- F. Pipe Sleeves and Embedded Items:
1. Before pouring any concrete, determine that all embedded metal pipe sleeves, anchors, anchor slots, anchor bolts, hangers, concrete inserts, and similar items are firmly secured and fastened in place and that all embedded items required of other divisions have been furnished and installed.
- G. Repairing and Patching: Remove and replace at no additional cost any concrete not formed as shown on plans, concrete out of alignment, surfaces beyond required tolerances or defective surfaces which cannot be properly repaired or patched, including any concrete failing to meet the strength requirements as determined by the testing laboratory.

3.02 CURING

- A. Protect concrete from premature drying. Provide temporary housing, covering, or other protection used in curing and keep in place and intact a minimum of 24 hours after artificial heating or cooling has been discontinued. Follow finishing operations with curing measures within two hours.
- B. Keep concrete continuously moist for 7 days. Prevent rapid drying at the end of the curing period. Accomplish cure by one of the following methods:
1. Ponding or continuous sprinkling.
 2. Absorptive mats or fabrics kept continuously wet.
 3. Non-staining waterproof paper as specified. Keep all joints airtight and weighted in place.
 4. Non-staining polyethylene film as specified. Keep all joints weighted to prevent wind penetration.

3.03 FIELD QUALITY CONTROL

- A. Comply with pertinent provisions of Article 1106.02, Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation.
- B. Work installed under this section shall be performed under the supervision of a capable foreman, in conformance with the standards referenced above.
- C. Testing: Owner will hire a Testing Agency to perform the following tests:
 - 1. Slump Tests:
 - a. Test Procedure: Maintain a slump cone on job during all concreting operations. Conduct slump tests in accordance with ASTM C 143.
 - 2. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one test for each set of compression test specimens.
 - 3. Compression Tests of Concrete Cylinders:
 - a. Cost Responsibility for Tests: Owner will have concrete test cylinders tested by a testing laboratory supervised by a professional Engineer licensed in the state of Iowa, and shall pay all costs of taking samples and performing the tests. Test cylinders shall be made in accordance with the "Standard Method of Making and Curing Concrete Compression and Flexure Test Specimens in The field" (ASTM C 31.) for compliance with specified strength.
 - b. Frequency of Testing: Take two sets of three test cylinders for every concrete placement and not less than two sets of three test cylinders for each additional 50 cubic yards of concrete placed. The first set of cylinders shall be considered control cylinders and shall be laboratory cured at 70° F. Of the control set, one cylinder shall be tested at 7 days, one at 28 days, and the third cylinder shall be tested only if 28-day cylinder failed. The second set of cylinders shall be job cured and used to determine when forms and shoring may be removed. The first of these cylinders shall be tested at 7 days and the other two cylinders tested only if required.
 - c. Number of Tests Per Set: Each set of test cylinder shall consist of three concrete test cylinders, 6" x 12" and each set shall be considered as one test. All cylinders in each set shall be taken from the same batch of concrete. Contractor shall note date, location and concrete slump on each cylinder made.
 - d. Location of Making Cylinders: Concrete test cylinders shall be made at discharge end of chute, slide or pipe and not at truck or mixer.
 - e. Strength Requirements: The strength level of the concrete will be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength f'_c and no individual strength test result falls below the specified strength f'_c by more than 500 psi.

- f. Compression Test Failure: Failure of concrete compression tests to meet specified strength will require a load test or test cores at Contractor's expense. Failure to meet required live and dead loads or meet strength requirements of cores shall constitute rejection or consideration for rejection by the ENGINEER. Cost of measures to make work satisfactory shall be paid by Contractor.
- 4. Reports:
 - a. Submit test result reports to Engineer.

END OF SECTION

DIVISION 23

HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

SECTION 23 00 00
HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Furnish all labor, materials, tools, equipment, scaffolding, transportation, permits, inspection certificates and temporary protection necessary to complete installation of all work as shown on Project Drawings and/or called for in these specifications. Drawings and specifications shall be considered mutually coordinate, and any material included in one but not the other shall be furnished as though required in both. All material necessary to provide a complete working installation shall be furnished whether mentioned or not.
- B. Before turning equipment over to the Owner, the Contractor shall thoroughly test equipment and instruct the Owner or his representative in its operations and maintenance.

1.02 CODES AND STANDARDS

- A. Comply with the latest applicable codes and standards as set forth by the following:

AGA	American Gas Association
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute, Inc.
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
DNR	Department of Natural Resources, State of Iowa
EPA	U.S. Environmental Protection Agency
MCA	Mechanical Contractors Association
MSS	Manufactures Standardization Society
NADCA	National Air Duct Cleaners Association
NBS	National Bureau of Standards
OSHA	Occupational Safety and Health Act
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
	State and Local Codes and Ordinances

- B. If there is a discrepancy between the codes and regulations having jurisdiction over this installation and these specifications, the Engineer shall determine the method or equipment used.
- C. If the Contractor notes, at the time of bidding, any parts of the drawings and specifications which are not in accordance with applicable codes or regulations, he shall inform the Engineer in writing, requesting a clarification. If there is insufficient time to follow this procedure, he shall submit with his proposal a separate price required to make the system shown on the drawings comply with the codes and regulations.
- D. All changes to the system made after the letting of the contract, in order to comply with the applicable codes or the requirements of the Inspector, shall be made by the Contractor without cost to the Owner.

- E. If there is a discrepancy between the manufacturer's recommendations and these specifications, the manufacturer's recommendations shall determine the method or equipment used.

1.03 PERMITS, FEES, TAXES, INSPECTIONS

- A. Procure all applicable permits and licenses.
- B. Abide by all applicable laws, regulations, ordinances, and other rules of the State or Political Subdivision wherein the work is done, or as required by any duly constituted public authority.
- C. Pay all applicable charges for such permits or licenses that may be required.
- D. Pay all applicable fees and taxes imposed by the State, Municipal and/or other regulatory bodies.
- E. Pay all charges arising out of required inspections by the codes, permits, licenses or as otherwise may be required by an authorized body.

1.04 EXAMINATION OF DRAWINGS

- A. The drawings for the mechanical work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
- B. Contractor shall determine the exact locations of the equipment and rough-ins, and the exact routing of pipes and ducts so as to best fit the layout of the job.
- C. Scaling of the drawings will not be sufficient or accurate for determine these locations.
- D. Where job conditions require reasonable changes in indicated arrangements/locations, such changes shall be made by the Contractor at no additional cost to the Owner.
- E. Because of the scale of the drawings, certain basic items, such as fittings, boxes, valves, unions, etc., may not be shown, but where such items are required by other sections of the specifications or where they are required for proper installation of the work, such items shall be furnished and installed.
- F. The determination of quantities of material and equipment required shall be made by the Contractor from the drawings. Schedules on the drawings and in the specifications are completed as an aid to the Contractor, but where discrepancies arise, the greater number shall govern.

1.05 FIELD MEASUREMENTS

- A. Before ordering any materials or fabricating any supports, etc, the Contractor shall verify all pertinent dimensions at the job site and be responsible for their accuracy.

1.06 QUALITY ASSURANCE

- A. The Label or listing of the specified agency will be acceptable evidence that units conform to the requirements.

- B. Where equipment is specified to conform to the requirements of the ASME Boiler and Pressure Vessel Code for Design, fabrication and installation shall conform to the code in every respect.
- C. All equipment shall be installed in accordance with manufacturer's recommendations. Any proposed deviations shall be requested from the Engineer before installation.
- D. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those of the Base specification, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the performance from the system into which these items are placed. This includes changes found necessary during the testing, adjusting, and balancing phases of the project.

1.07 PRODUCT HANDLING

- A. Cover and protect all materials and equipment stored on-site from weather. Support above ground on temporary basis.
- B. Protect all mechanical products and control devices from damage, dust and construction debris. After installation is completed or while storing inside building, wrap and enclose all mechanical fixtures, equipment and control devices with canvas or heavy mill plastic, secured with wire or cord. Fixtures may be protected with the factory applied heavy paper or carton they are shipped in. Do not remove protection device until room or area is cleaned and free of dust and debris.

1.08 WORK COORDINATION

- A. Each Contractor shall coordinate his work with adjacent work and shall cooperate with all other trades so as to facilitate the general progress of the work. Each trade shall afford all other trades every reasonable opportunity for installation of their work and for the storage of their materials. In no case, will any Contractor be permitted to exclude from the premises or work place any other Contractor in the executing or installation of their work.
- B. Each trade shall perform its work in proper sequence in relation to that of other trades and as approved by the Engineer. Any cost caused by defective or ill-timed work shall be borne by the installation Contractor.
- C. Each Contractor shall arrange his work and dispose of material so as not to interfere with the work or storage of materials of others. Each Contractor shall join their work to that of others in accordance with the intent of the Project Drawings and Specifications.
- D. All trades shall work in cooperation with each other, and fit their work into the structure as job conditions may demand. All final decisions as to right-of-way and run of pipes and ducts, etc. shall be made by the Engineer or an authorized representative.
- E. It shall be the responsibility of the Contractor to keep constant check on the progress of the work so each particular trade can insure proper preparation for installation of that trade's work and not cause delay in the progress of the work. It shall further be the responsibility of the Contractor to periodically make inspection of work in progress and to notify the Engineer when work is complete in compliance with the Project Drawings and Specifications.

1.09 ACCESSIBILITY

- A. Provide access panels to valves, dampers, controls and equipment in walls or above inaccessible ceiling.

1.10 CLEAN-UP

- A. Remove all dust, plaster and construction debris from fixtures, equipment and control devices prior to painting or occupancy by Owner.
- B. Brush clean and apply one coat of rust-resistant paint to all new piping, pipe fittings and weld joints that have rusted during construction, prior to applying pipe insulation.
- C. All piping, pipe covering and ductwork shall be covered and protected from plaster, dust, paint droppings and other construction debris during construction.
- D. Paint all new equipment, which has rusted or had finish marred during construction to the satisfaction of Engineer. Replace if satisfactory restoration cannot be made.

1.11 OPERATING INSTRUCTIONS

- A. Deliver to the Owner, Maintenance and Operating Instruction, with replacement parts list, for all fixtures and equipment.
- B. Include a complete lubrication and maintenance schedule for all new equipment, with types of lubricants and frequencies recommended.
- C. Instruct and demonstrate to the Owner or his representative the operation and servicing (normal maintenance) of all equipment and systems provided. Use qualified manufacturer's representatives to explain heat or cold generation and temperature control equipment.

1.12 SYSTEM START-UP

- A. The mechanical systems included in the construction documents are to be complete and operating systems. The system start-up, testing, balancing, and satisfactory system performance is the responsibility of the Contractor. This shall include all calibration and adjustments of controls, noise level adjustments and final comfort factor adjustments that may be required.
- B. The Contractor shall adjust the mechanical systems and controls at season changes during the one-year warranty period, as required, to provide satisfactory operation and to prove performance of system used in all seasons.
- C. All operating conditions and control sequences shall be simulated and tested during the start-up period. Testing shall also include all interlocks, safety shutdowns, damper position controls, and alarms.

END OF SECTION

SECTION 23 11 26
FACILITY LIQUEFIED-PETROLEUM PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Propane gas piping system.
- B. Valves.
- C. Gas Regulator

1.02 SUBMITTALS

- A. Product Data: Provide data on valves and accessories. Provide manufacturer's catalog information. Indicate valve data and ratings.

1.03 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

1.04 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with all applicable local, state, and federal codes.
- B. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 - PRODUCTS

2.01 PROPANE GAS PIPING BELOW GRADE

- A. Polyethylene Pipe, Tubing, and Fittings: ASTM D 2513 and as recommended by the manufacturer for use with LP gas.
- B. Polyethylene pipe and fitting joints shall be by heat fusion or factory assembled transition fittings.

- C. Contractor shall provide suitable transition coupling at building steel to polyethylene connection.
- D. Contractor shall bury a tracer wire with the underground polyethylene pipe.
- E. Contractor shall provide a cap or closure for any abandon underground polyethylene pipe.

2.02 PROPANE GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53 or A120, Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234, forged steel welding type.
 - 2. Joints: NFPA 58, threaded or welded.

2.03 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2 inches and Under:
 - 1. Ferrous pipe: 150-psi malleable iron, ground joint, threaded unions.
- B. Pipe Size Over 2 inches:
 - 1. Ferrous pipe: 150 psi forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets.

2.04 PLUG VALVES

- A. Manufacturers:
 - 1. Powell
 - 2. Lunkenheimer
 - 3. Crane
- B. Up to and including 2 inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends.

2.05 GAS REGULATOR

- A. Contractor to install gas regulator inside the generator enclosure.
- B. Locate gas regulator as shown on drawings.
- C. Coordinate and maintain 5-foot separation from air intakes, building openings, and ignition sources per NFPA 58.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Provide piping connections to equipment with flanges or unions.
- D. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- E. Route piping in orderly manner and maintain gradient.
- F. Group piping whenever practical at common elevations.
- G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- H. Provide clearance for installation of insulation and access to valves and fittings.
- I. Exercise all necessary care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not erect or install any item that is not clean.
- J. Run pipelines straight and true, parallel to building lines with a minimum use of offsets and couplings. Provide only such offsets as may be required to provide necessary headroom or clearance and to provide necessary flexibility in pipelines.
- K. Changes in direction of pipelines shall be made only with fittings or pipe bends. Changes in size shall be made only with fittings. Miter fittings, face or flush bushings, or street elbows shall be used. All fittings shall be of the long radius type, unless otherwise shown on the drawings or specified. Welded elbows of angles that are not available as standard elbows to form smooth, long radius fittings.
- L. Arrange piping and piping connections so that equipment being served may be serviced or totally removed without disturbing piping beyond final connections and associated shut-off valves.
- M. All pipes shall be cut to exact measurement and installed without springing or forcing except in the case of expansion loops where cold springing is indicated on the drawings.
- N. Particular care shall be taken to avoid creating, even temporarily, undue loads, forces or strains on valves, equipment to building elements with piping connection or piping supports.
- O. Install valves with stems upright or horizontal.
- P. Provide a tracer wire for all underground nonmetallic piping

3.02 PROPANE GAS PIPING SYSTEMS

- A. System shall be approved by Iowa State Plumbing Code.
- B. Provide unions, at piping connections to all equipment, control valves, etc.
- C. Use dielectric unions for connecting dissimilar piping materials, copper, steel, or cast iron pipe, or fittings. Do not support metal piping with dissimilar/incompatible materials.

- D. Provide metal support affixed to building. Wood supports, acceptable on concrete pads, shall be of treated wood.
- E. Seal all openings around piping and pipe sleeves penetrating walls, floors and ceiling, including areas above suspended ceilings.
- F. Branch connections shall be made with standard tee or cross fittings of the type required for the service unless otherwise specified herein or detailed on the drawings.
- G. Threaded Joints:
 - 1. Ream pipe ends and remove all burrs and chips formed in cutting and threading.
 - 2. Protect plated pipe and valve bodies from wrench marks when making up joints.
 - 3. Apply Teflon tape thread lubricant to male threads.
- H. After installation, clean all metal pipes and fittings of rust and scale; then coat with Black paint.

3.03 PIPING SYSTEM TESTING

- A. Testing shall be conducted in the presence of the Owner's representative, the Engineer or their representative. Contractor shall notify the Engineer of proposed tests at least two days prior to testing.
- B. Respective piping Contractor shall provide all equipment required to conduct tests.
- C. Submit report of test results to the Owner and Engineer.
- D. Piping systems shall be tested as scheduled below, but not less the 50 percent above the operating pressure of the system.

System	Test	Test Pressure	Hold Period	Permissible Pressure Drop
Propane Gas	Pneumatic	3 psi inside 15 psi outside	2 hrs.	None

- E. All defects discovered during the tests shall be immediately corrected and piping system shall be retested until it qualifies. Defective joints found in welded piping shall be ground off and rewelded; screwed and soldered joints shall be disassembled, cleaned and rejoined as a new joint.
- F. Piping connected to specialties, or equipment with a lower pressure rating than specified test, shall be left unconnected or valve-off during test.
- G. After testing is completed on gas systems, fill system with gas and soap test all joints for leaks; or test with gas detection meter.

END OF SECTION

DIVISION 26

ELECTRICAL

SECTION 26 00 00
GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes all materials, equipment, and labor necessary for the installation of electrical systems.

1.02 CODES AND STANDARDS

- A. All materials supplied and all work performed shall comply with the latest revisions of applicable codes and standards of the following organizations:
 - 1. National Electric Code (NEC)
 - 2. National Fire Protection Association (NFPA)
 - 3. American National Standards Institute (ANSI)
 - 4. National Electric Manufacturers Association (NEMA)
 - 5. American Society for Testing and Materials (ASTM)
 - 6. Underwriters' Laboratories (UL)
 - 7. Institute of Electrical and Electronic Engineers (IEEE)
 - 8. Occupational Safety and Health Act (OSHA)
 - 9. All state and local codes as they apply.

1.03 GENERAL

- A. Contract Requirements
 - 1. Division 26 of the specifications covers the electrical systems of the project. It includes work performed by the electrical trades as well as trades not normally considered as electrical trades. These specifications are not intended to establish as a bill of material list for items required by the Contract, but are intended to establish material and performance standards
 - 2. Comply with all provisions of the Contract Documents including General Conditions, Supplementary General Conditions, and Division 1 of the specifications.
- B. SCOPE
 - 1. Provide all items and work indicated on the drawings and called for in the specifications. This includes all incidentals, equipment, appliances services, hoisting, scaffolding, supports, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide complete systems. Perform start-up and checkout on each item and system to provide fully operable systems.

2. It is the intent of the drawings and specifications to provide a complete workable system ready for the Owner's operation. Any item not specifically shown on the drawings or called for in the specifications, but normally required to conform with the intent, are to be considered a part of the Contract. Certain terms such as "shall, provide, install, complete, start up" are not used in some parts of these specifications. This does not indicate that the items shall be less than completely installed or that systems shall be less than complete.
3. Examine and compare the electrical drawings and specifications with the drawings and specifications of other trades, and report any discrepancies between then to the Engineer and obtain from him written instructions for changes necessary in the work. At time of bid the most stringent requirements must be included in said bid.
4. Install and coordinate the electrical work in cooperation with other trades installing inter-related work. Before installation, make proper provisions to avoid interferences in a manner approved by the Engineer.
5. The electrical work includes, but is not limited to the following:
 - a. Demolition of existing electrical connections, equipment and devices necessary to accomplish reconfiguration of feeders.
 - b. Temporary power and lighting system.
 - c. Reconfiguration of electrical service entrance, metering and grounding.
 - d. Replacement of distribution panelboard feeders as necessary to accomplish reconfiguration.
 - e. Installation of branch circuit wiring and devices (Conduit, boxes, conductors, etc.) for generator support requirements.
 - f. Rough in and connection to equipment as indicated on plans.
 - g. Coordination with local utility for service rework and switchover outage.
6. Work Not Included:
 - a. Vending equipment installation and connection.
 - b. Low voltage signal/communication equipment (telephone, computer, security, weather reporting system, etc.) installation or wiring.
 - c. Temperature control equipment and wiring.
 - d. Equipment painting (other than touch-up).
 - e. 15kV power service work shall be by local utility.

C. FEES

1. All local fees, permits and services of inspection authorities shall be obtained and paid for by the Contractor.
2. All bids shall include a \$5,000 allowance for each Circa 1965 building site (3 sites total) for utility service and transformer relocations.
3. All bids shall include a \$1,500 allowance for each Circa 2000 building site for utility activity.

D. DEFINITIONS

1. The following definitions are utilized within the drawings specifications:

- a. "PROVIDE" means to supply, purchase, transport, place, erect, and connect. Test and turn over to the Owner, complete and ready for regular operations, the particular work referred to.
- b. "INSTALL" means to join, unite, fasten, link, attach, set up or otherwise connect together before testing and turning over to the Owner, complete and ready for regular operation, the particular work referred to.
- c. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories and all other items customarily required to the proper and complete application for the particular work referred to.
- d. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such work.
- e. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
- f. "AS DIRECTED" means as directed by the Engineer, or his representative.
- g. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed within hung ceilings.

- 2. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.

E. CONTRACT DRAWINGS AND SYMBOLS

- 1. The electrical drawings listed in the Drawing Index, together with these specifications, are an integral part of the Electrical contract, what is called for in one is as binding as if called for in both. In case of conflict, the greater quantity shall prevail, subject to the approval of the Architect-Engineer.
- 2. The drawings are as accurate as planning can determine; however, field verification of all dimensions is directed. Specifications and drawings are for assistance and guidance, but exact locations, distances and levels shall be governed by field conditions.
- 3. The electrical drawings are diagrammatic only, but shall be followed as closely as actual construction of the building and work of other trades will permit. All changes from these drawings, necessary to adapt the work of other trades and to make the work of this Contractor conform to the building as constructed shall be made by the Electrical Contractor.
- 4. Field verify all measurements prior to installation. Electrical drawings shall not be scaled for the purpose of equipment installation, all measurements being derived from Architectural plans and shop drawings.
- 5. The graphic symbols in the "Electrical Symbols Schedule" list on the drawings have been used in part or in whole in the preparation of the electrical drawings accompanying these specifications.
- 6. Riser diagrams and key plans are shown only as a convenience to the Contractor and Electrician making the installation. In case of conflict between a Riser diagram and a floor plan, the greater quantity or better quality shall prevail and shall be subject to the approval of the Architect-Engineer.

7. The locations of lighting fixtures, outlets, panels and other equipment indicated on the drawings are approximately correct. Locations are understood to be subject to revision as may be found necessary or desirable at the time the work is installed in order to meet field conditions or to coordinate with modular requirements of ceilings. Any significant changes in location of outlets, cabinets, etc., necessary in order to meet field conditions shall be brought to the immediate attention of the Engineer and receive his approval before such alterations are made.
8. Exercise particular caution with reference to the location of panels, equipment, switches, etc. Have precise and defined locations approved by the Engineer before proceeding with the installation.
9. The drawings generally do not indicate the exact number of wires in each conduit for the branch circuit wiring of fixtures, and outlets, or the actual circuiting. Provide the correct wire size and quantity as required by the indicated circuiting and/or circuit numbers indicated and control, wiring diagrams, if any, specified voltage drop or maximum distance limitations, and the applicable requirements of the NEC. Derate in the manner discussed in specification Section 26 05 13 - Wires and Cables.
10. Adjust location of conduits, panels, equipment, pull boxes, fixtures, etc. to accommodate the work to prevent interferences, both anticipated and encountered. Determine the exact route and location of each raceway prior to fabrication.
11. Right-of-Way: Lines that pitch to have the right-of-way over those which do not pitch. For example: steam, condensate, and plumbing drains normally have the right-of-way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
12. Make offsets, transitions and changes in direction in raceways and as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the drawings.
13. Wherever the work is of sufficient complexity, prepare additional detail drawings to scale similar or larger than the bidding drawings, prepared on tracing medium of the same size as Contract drawings. Such detailed work to be clearly identified on the drawings as to the area to which it applies. With these layouts, coordinate the work with the work of other trades.

F. COORDINATION OF THE WORK

1. Coordinate and install the electrical work in cooperation with other trades. Before installation, make provisions to avoid interferences. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto, including equipment areas, chases and finished suspended ceilings.
2. The Contractor shall furnish services of an experienced Superintendent, who shall be in constant charge of all work, and who shall coordinate his work with the work of other trades. No work shall be installed before coordinating with other trades.

3. Coordinate, project and schedule work with other trades in accordance with the construction sequence. Transmit to other trades all information required for work to be provided under their respective sections in ample time for installation.
4. The Contractor shall order the progress of his work so as to conform to the progress of the work of other trades and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from the defective or ill-timed work performed under this section shall be borne by the Contractor.
5. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Applicable equipment and materials to be listed by Underwriters' Laboratories and manufactured in accordance with ASME, NEMA, ANSI or IEEE standards and as approved by local authorities having jurisdiction.
- B. All materials used shall bear the Underwriters' Laboratory, Inc. label provided a standard has been established for the material in question.
- C. Use only material manufacturers that are listed on the drawings or approved in the specification. If products and materials are not listed in either of the above, use first class products and materials.
- D. All materials and products furnished by the Contractor shall be new and unused (temporary lighting and power products are excluded) and free from defects, damage and corrosion.
- E. All equipment capacities, etc. are listed for job site operating conditions. All equipment sensitive to altitudes or ambient temperatures to be derated and method of derating shown on the shop drawings. Where operating conditions shown differ from the laboratory test conditions, the equipment to be derated and the method of derating shown on shop drawings.
- F. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material shall be the product of one manufacturer throughout. Multiple manufacturers of the same type of equipment will not be permitted.

2.02 SUBMITTAL

- A. Provide submittals to proposed products in the manner as discussed in the "Shop Drawing" discussion of the Supplemental General Conditions.
- B. Provide submittals for Engineer's review for the following products.
 1. Section 26 05 00
 - a. Conduit
 - b. Boxes

2. Section 26 05 13
 - a. 600-volt conductors
 3. Section 26 24 00
 - a. Panelboard breakers
 4. Section 26 28 16
 - a. Disconnect switches
 5. Section 26 45 00
 - a. Connectors (fittings/clamps)
 6. Section 26 36 00
 - a. Transfer switch
 7. Section 26 32 00
 - a. Package Generator
- C. Submittals shall include, but are not limited to, catalog cuts.

2.03 SUBSTITUTION

- A. Substitutions shall be considered at the time of submittal review
- B. Substituted material shall be equal in quality and performance as that material specified.
- C. The Engineer shall determine the quality and performance acceptability of any substitute submitted for review.
- D. The bid price submitted by the Contractor is assumed to include the use of specified material. There shall be no cost adjustment for the use of specified material.

PART 3 - EXECUTION

3.01 GENERAL

- A. Follow manufacturer's instructions for installing, connecting, and adjusting all equipment. Provide one copy of such instructions to the Engineer before installing any equipment. Provide a copy of the instructions at the equipment during any work on the equipment. Provide all special supports, connections, wiring accessories, etc.
- B. Use mechanics skilled in their trade for all work.
- C. Keep all items protected before and after installation.
- D. Before commencing work, examine all adjoining, underlying, etc., work on which this work is in any way dependent for perfect workmanship. Become thoroughly familiar with actual existing conditions to which connections must be made or which must be changed or altered. Report any condition which prevents performance of first class work.
- E. Perform all tests required by local authorities in addition to tests specified herein, such as life safety systems.

3.02 DEMOLITION AND CONTINUANCE OF EXISTING SERVICES

- A. Coordinate demolition with all trades and Owners. Existing building electrical shall be removed as required to achieve final result of One-Line diagram for site.
- B. Should any existing services, etc., interfere with new construction, the Electrical Contractor shall alter or reroute such existing equipment to facilitate new construction.
- C. Coordinate electrical outages with Owner's representative prior to any interruption in electrical service.

3.03 CLEANING UP

- A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean, subject to the Engineer's instructions, which shall be promptly carried out.
- B. Contractor shall clean all fixtures and equipment at the completion of the project.
- C. All panelboards, wireways, cabinets, enclosures, etc. shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. The Engineer as required shall open equipment for observation.

3.04 TESTING

- A. Complete testing of equipment and systems shall be provided in accordance with the Contract Documents.
- B. Notify the Engineer seven days prior to the test dates. If the Engineer so elect not to witness a specific test, a statement of certification must be forwarded to the Engineer for approval.

3.05 INSPECTIONS

- A. The Contractor shall see that local inspection authorities are notified when inspections are required by code.
- B. The Contract shall provide all necessary assistance to the Inspector when he is making an inspection.

3.06 RECORD OF CHANGES

- A. The Contractor shall maintain at the job site a complete set of electrical plans upon which he shall clearly mark and note in complete detail any changes made to the location and arrangement of electrical equipment, devices and wiring as a result of building construction conditions and change orders. Revisions shall be made daily when they occur.
- B. The Record Drawings shall record all changes from the original drawings and all pertinent information not shown on the original drawings to include:
 - 1. Addenda and change order revisions.
 - 2. Route and location of all underground and concealed feeders.

3. Interconnecting conduit between branch circuit items, junction boxes and panels. Actual route of conduit is not required, only how the various branch items are interconnected.
 4. Circuit numbers for all items where they do not agree with the plans. Circuit numbers on record drawings and panelboard directories must agree.
- C. The Contractor shall prepare "as-built" drawings as required by the Contract Documents. At a minimum, provide one set of construction drawings which clearly and legibly indicate the information required in Paragraph B. Above for record drawings. The "as-built" drawings will be marked "AS-BUILT Drawings" near the title block and dated on each drawing before being turned over to the Owner at the completion of the project.

3.07 PROJECT CLOSEOUT

- A. Provide project closeout documents in accordance with the Contract Documents. See Division 1 - Requirements.
- B. Provide two copies of maintenance and operation manuals consisting of all approved shop drawings and manufacturer's installation and operation instructions shipped with the equipment. Shop drawings and manufacturer's instructions shall be consolidated into a single 3-ring binder for electrical equipment.

END OF SECTION

SECTION 26 05 00
CONDUIT AND ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes furnishing and installing all conduits, fittings, and accessories as specified or indicated.

1.02 QUALITY ASSURANCE

- A. Applicable standards shall be latest revisions, supplements, and amendments to the following:

1. National Electrical Code (NEC).
2. Underwriters' Laboratories, Inc. (UL):
 - a. UL-6 - Rigid Metallic Electrical Conduit.
 - b. UL-467 - Electrical Grounding and Bonding Equipment.
3. American National Standards Institute, Inc. (ANSI):
 - a. C80.1 - Rigid Steel Conduit, Zinc Coated.
 - b. C80A - Fittings for Rigid Metal Conduit and EMT.
4. National Electrical Manufacturers Association (NEMA):
 - a. FB1 - Fittings and Supports for Conduit and Cable Assemblies.

- B. Acceptable Manufacturers:

1. Galvanized Rigid Steel Conduit and Electrical Metallic Tubing:
 - a. Allied Tube and Conduit Corporation.
 - b. Triangle PWC, Inc.
 - c. Republic Steel Corporation.
2. Conduit Fittings for Rigid Metallic Conduit:
 - a. Heavy Duty Fittings:
 - (1) Appleton Electric Company.
 - (2) Crouse-Hinds Company.
 - (3) O.Z. Gedney Company.
3. PVC conduit
 - a. Carbon "PVC Power and Communications Duct"
 - b. CertainTeed Corporation "PVC Utility Duct"
 - c. George-Ingram

PART 2 - PRODUCTS

2.01 DESIGN REQUIREMENTS

- A. UL Listed and labeled on each conduit length, fitting, and accessory.
- B. Sizes of conduit, fittings, and accessories as indicated, specified, or as required by applicable standards or codes.

2.02 RIGID STEEL CONDUIT & FITTINGS

- A. Mild ductile steel, circular in cross section with uniform wall thickness sufficiently accurate to cut clean threads.
- B. Each length threaded on both ends and threads protected by same process as used on each length. Threads cut after protective coatings are applied shall be retreated with the same zinc coating through a second hot-dip process.
- C. All scale, grease, dirt, burrs, and other foreign matter removed from inside and outside prior to application of coating materials.
- D. Galvanized by the hot-dip process as follows:
 - 1. Interior and exterior surfaces coated with a solid, unbroken layer of 99 percent virgin zinc by dipping.
 - 2. Coating not to show fixed deposits of copper after four 1-minute immersions in a standard copper sulfate solution.
 - 3. One coat of zinc chromate finish on inside and outside surfaces to prevent oxidation and white rust.
- E. Couplings, elbows and fittings shall be fabricated, coated and finished by the same process as conduit.
- F. All fittings and couplings are to be full-threaded type, split or setscrew types are not allowed.
- G. Uni-Swivel or Uni-Couple or other similar types of couplings will not be permitted.
- H. Minimum size shall be 3/4 inch nominal diameter.

2.03 ELECTRICAL METALLIC TUBING & FITTINGS

- A. Shall be UL listed.
- B. Shall be steel, zinc coated on the outside, and enamel coated on the inside surface.
- C. Connectors and fittings shall be of the compression type

2.04 PLASTIC/PVC CONDUIT

- A. Fabricated from self-extinguishing high-impact polyvinyl chloride.
- B. Fittings and accessories fabricated from same material as conduit.
- C. Solvent-cement type joints as recommended by manufacturer.
- D. Inside diameter no less than that of rigid steel conduit.
- E. Dielectric strength as minimum of 400 volts per mil.

- F. Rated and labeled for use with 90 degrees C rated conductors.
- G. Each length of conduit furnished with one belled end per length.
- H. To be Schedule 40 unless noted otherwise, or installed under vehicle drives or parking areas. Schedule 80, PVC conduit shall be used in these areas where Schedule 40 exceptions are required or noted.
- I. Flexible nonmetallic conduit (Smurf tube) shall be allowable when encased in concrete or in floor.

2.05 INGROUND HAND HOLES

- A. For reference in event of replacement of field construction damaged units.
- B. Boxes shall be non-corrosion composite material, green in color to blend into grass.
- C. Inside dimensions of hand hole shall be 12 inches by 12 inches with a 12-inch depth, no bottom. Provide extensions as required for a "clean installation".
- D. Shall have a bolt on matching cover.
- E. Shall be a Quazite Model No. PC1212BA12 with a No. PC1212CA00 cover with "Electric" logo on cover; or equal in concrete as 12-inch round with steel lid. Hand-holes for utility primary shall meet local utility requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install all exposed conduits in a neat manner and parallel to or at right angles to building lines and in accordance with the NEC.
- B. Install underground conduits at depths indicated on drawing or as required by the NEC. Shift elevation as required to clear existing underground utilities.
- C. Running threads will not be permitted.
- D. Coat all field cut threads, scars, or abrasions in galvanized conduit with an approved organic zinc rich primer equivalent to Koppers' "Organic Zinc".
- E. Coat all thread connections with anti-oxidizing compound approved by conduit manufacturer. Compound shall be suitable for steel-to-steel, steel-to-aluminum, and steel-to-PVC connections.
- F. Seal all conduit penetrations through concrete floors or walls with non-shrinking grout.
- G. Carefully ream ends of all conduit lengths after cutting to eliminate sharp burrs.
- H. Clean all conduits with swabs and mandrels after installation.
- I. Install a nylon or polypropylene pull rope in all communications conduits (above and below grade) and all spare underground ducts. Cap spare underground ducts for future use.

- J. Conduit fittings shall be installed as specified, indicated, or necessary.
- K. Conduit support system shall be constructed with sufficient rigidity to hold all conduits in permanent and neat alignment.
- L. Conduit support members, clamps, and hardware shall be galvanized steel.
- M. Conduit Types shall be used as follows:
 - 1. Underground or outside conduit, shall be PVC schedule 40 or 80, unless noted as being GRS conduit. Above grade shall be GRS or intermediate grade metal.
 - 2. Flexible nonmetallic shall be allowed when encased in concrete or in floor.
- N. Underground PVC conduits shall transition to galvanized rigid steel conduit before turning up to exit earth or concrete floor.
- O. Install hand holes with the top flush with grade. Install box on 8 inches of crushed compacted rock to support box and to provide drainage. Conduits shall turn up into hand hole with a 90-degree bend. Conduits shall have bushings on ends and protrude 2 inches above gravel. Seal conduit openings with mastic after wires are installed. Empty spare conduits shall be plugged to prevent debris from entering conduits.

END OF SECTION

SECTION 26 05 13
WIRES AND CABLES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes furnishing and installing 600-volt power, control cable, and instrumentation and communication cable.

1.02 QUALITY ASSURANCE

- A. Applicable standards shall be the latest revisions, supplements, and amendments to the following:
1. National Electrical Code (NEC)
 2. Underwriters' Laboratories, (UL) - 1072
 3. Institute of Electrical and Electronics Engineers (IEEE) - 383
 4. Insulated Cable Engineers Association (ICEA) - S48-516
 5. Association of Edison Illuminating Companies (AEIC) - CS6
 6. American Society for Testing and Materials (ASTM) - B8
- B. Acceptable Manufacturers:
1. Pulling Lubricant
 - a. American Polywater Corporation
 - b. Ideal Industries, Inc.
 2. 600 Volt Cable (120/240 volt power and lighting circuits)
 - a. Rome Cable Corporation
 - b. Triangle
 - c. Southwire

PART 2 - PRODUCTS

2.01 PULLING LUBRICANTS

- A. Pulling compound shall be listed by manufacturer as compatible with cable being pulled.
- B. Pulling compound shall contain no waxes, greases, silicones, or polyabkalene glycol oils or waxes.
- C. Pulling compound shall be rated for the air temperature in which the installation is being performed.
- D. Contractor shall follow the manufacturer's recommendation of application of pulling compound if used.

2.02 SINGLE-CONDUCTOR 600-VOLT WIRE

- A. Type THWN Wire (Interconnection Cable for Power, Lighting or Control)
 - 1. Material: Annealed uncoated copper in accordance with ASTM B3.
 - 2. Size: As indicated on the drawings.
 - 3. Description: Single-conductor stranded wire, 600-volt, and 75 degrees C temperature rating.
 - 4. Insulation: Heat- and moisture-resistant thermoplastic.
 - 5. Jacket: Smooth nylon, 4 mils thick (minimum).
 - 6. Identification: Mark surface of wire with manufacturer's identification, conductor size, and voltage rating.
 - 7. Minimum conductor size:
 - a. Power: #12 AWG
 - b. Control circuits: #14 AWG

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Cable shall be stored covered and elevated from ground on blocks to prevent contamination from mud, dirt, or water.
- B. Contractor shall swab and clean each conduit before installation of cable commences. Swab methods shall consist of wire brush and foam swab utilized together in proper size for conduit.
- C. Contractor shall use pulling lubricant as required or recommended by manufacturer to minimize strain on wires or cables.
- D. Ground Cable
 - 1. Reference Section 26 45 00 of this specification for installation of ground cable.
 - 2. Maintain color coding on grounding circuits as follows:
 - a. Green - Equipment grounding conductor.
- E. 600-Volt Cable
 - 1. Install where indicated on the drawings with size as indicated.
 - 2. Power circuit conductors shall be color coded as follows:
 - a. Black - Line 1 or Line 2
 - b. Green - Ground
 - c. White - Neutral
 - 3. 600-volt cable shall be derated for ambient temperature per NEC.

4. 600-volt cable shall be derated for fill by increasing the size to meet the NEC derating percentage stated for the number of current carrying conductors (including all neutral conductors) using the following nonderated schedule:
 - a. 20 amp #12 AWG
 - b. 30 amp #10 AWG
 - c. 50 amp #8 AWG

F. Controls and Instrumental Cable

1. Provide manufacturer's supplied or recommended cable.

END OF SECTION

SECTION 26 24 00
PANELBOARDS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes furnishing and installing all distribution panelboard, as shown on the drawings.

1.02 QUALITY ASSURANCE

- A. Applicable standards shall be the latest revisions, supplements, and amendments to the following:
 - 1. National Electrical Code (NEC).
 - 2. Underwriters' Laboratories (UL).
 - 3. National Electrical Manufacturers Association (NEMA).
 - 4. American National Standards Institute (ANSI).
- B. Acceptable Manufacturers (Determine by equipment at site)
 - 1. General Electric
 - 2. Square D
 - 3. Cutler-Hammer
 - 4. Engineer approved equal

PART 2 - PRODUCTS

2.01 PANELBOARDS

- A. Panelboards shall have main rating, main breaker, number of poles, and branch breakers as shown by the panelboard schedules on the drawings. Panels shall be UL labeled.
- B. 240/120-volt, single-phase, 3-wire panels shall have 100 percent rated neutral bus with a UL series connected rating of 22,000 AIC.
- C. Panelboards shall be equipped with bolt on breakers.
- D. GFI breakers shall be installed where panel schedule calls for ground fault breakers and as by specifications or as per manufacturer's recommended practice.
- E. Breakers shall not be of "Tandem" design.

- F. NEMA classification of panels shall be NEMA 1 unless noted otherwise on the drawings or specifications.

PART 3 - EXECUTION

3.01 GENERAL

- A. Breaker placement shall be as determined to fit panel(s).
- B. Contractor shall TYPE panel schedule on schedule card at the end of the job. Cards shall accurately and clearly reflect the circuits serviced by the breakers.
- C. Modify existing schedule neatly at project completion.

END OF SECTION

SECTION 26 32 00
PACKAGED ENGINE GENERATOR SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section includes:
 - 1. This section describes:
 - a. Packaged engine generator set.
 - b. Radiator.
 - c. Heat exchanger.
 - d. Exhaust silencer and fittings.
 - e. Fuel fittings.
 - f. Control panel.
 - g. Battery and charger.
 - h. Weatherproof enclosure.
- B. Related work specified elsewhere:
 - 1. Section 26 00 00 - Electrical General Provisions
 - 2. Section 26 36 00 - Enclosed Transfer Switch

1.02 REFERENCES

- A. NEMA AB3 - Molded Case Circuit Breakers.
- B. NEMA MG1 - Motors and Generators.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum.)
- D. NFPA 30 - Flammable and Combustible Liquids Code.
- E. NFPA 70 - National Electrical Code.
- F. NFPA 99 - Health Care Facilities.
- G. NFPA 101 - Life Safety Code.
- H. NFPA 110 - Emergency and Standby Power Systems.

1.03 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Shop Drawings: Indicate electrical characteristics and connection requirements. Show plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, and electrical diagrams, including schematic and interconnection diagrams.

- C. Product Data: Provide data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, day tank, and remote radiator.
- D. Test Reports: Indicate results of performance testing.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.04 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division 1.
- B. Operation Data: Include instructions for normal operation.
- C. Maintenance Data: Include instructions for routine maintenance requirements, service manuals for engine and day tank, oil sampling and analysis for engine wear, and emergency maintenance procedures.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with NFPA 110.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience, and with service facilities within 100 miles of Project.
- B. Supplier: Authorized distributor of specified manufacturer with minimum three years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 1.
- B. Accept unit on site on skids. Inspect for damage.
- C. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

1.08 MAINTENANCE SERVICE

- A. Furnish service and maintenance of engine generator for one year from date of Substantial Completion.

1.09 MAINTENANCE MATERIALS

- A. Furnish one set of tools required for preventative maintenance of the engine generator system. Package tools in adequately sized metal tool box.

1.10 EXTRA MATERIALS

- A. Provide two of each fuel, oil and air filter element for engine generator system.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Cummins/Onan
- B. Substitutions: Under provisions of Section 26 00 00. Caterpillar and Kohler are approved manufacturers.

2.02 PACKAGE ENGINE GENERATOR SYSTEM

- A. Description: NFPA 110, engine generator system to provide source of power for Level 2 applications.
- B. Standby System Capacity: Plan stated KW 120 degrees C rise at elevation of 3,000 feet above sea level, rating using engine-mounted radiator engine mounted heat exchanger.

2.03 ENGINE

- A. Type: Water-cooled inline or V-type, two stroke cycle, internal combustion engine.
- B. Rating: Sufficient to operate under 10 percent overload for one hour in an ambient of 90 degrees F at elevation of 3,000 feet.
- C. Fuel System: Propane fuel.
- D. Engine Speed: 1800 rpm.
- E. Governor: Isochronous type to maintain engine speed within 0.5 percent, steady state, and 5 percent, no load to full load, with recovery to steady state within 2 seconds following sudden load changes.
- F. Safety Devices: Engine shutdown on high water temperature, low oil pressure, overspeed, and engine overcrank. Limits as selected by manufacturer.
- G. Engine Starting: DC starting system with positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Include remote starting control circuit, with MANUAL-OFF-REMOTE selector switch on engine-generator control panel.
- H. Engine Jacket Heater: Thermal circulation type water heater with integral thermostatic control, sized to maintain engine jacket water at 90 degrees F, and suitable for operation on 120 volts AC.
- I. Radiator: Radiator using glycol coolant, with blower type fan, sized to maintain safe engine temperature in ambient temperature of 110 degrees F. Radiator air flow restriction 0.5 inches of water maximum.

- J. Engine Accessories: Fuel filter, lube oil filter, intake air filter, lube oil cooler, fuel transfer pump, fuel priming pump, gear-driven water pump. Include fuel pressure gauge, water temperature gauge, and lube oil pressure gauge on engine/generator control panel. Provide means of assuming low temperature starting of vapor propane fuel.
- K. Mounting: Provide unit with suitable spring-type vibration isolators and mount on structural steel base.

2.04 GENERATOR

- A. Generator: NEMA MG1, single-phase, 4-pole, reconnectable brushless synchronous generator with brushless exciter.
- B. Rating: At 0.8 power factor, 120/240 volts, 60 Hz at 1800 rpm.
- C. Insulation Class: F.
- D. Enclosure: NEMA MG1, open drip proof. Provide in manufacturer's standard color of approximate description of "Sand". Standard Green or Yellow are not acceptable.
- E. Voltage Regulation: Include generator-mounted volts per hertz exciter-regulator to match engine and generator characteristics, with voltage regulation plus or minus 1 percent from no load to full load. Include manual controls to adjust voltage droop, voltage level (plus or minus 5 percent) and voltage gain.

2.05 ACCESSORIES

- A. Residential type enclosure to limit sound emissions to 60dB at 300 feet.
- B. Exhaust Silencer: Residential type silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, sized in accordance with engine manufacturer's instructions.
- C. Fuel connection, fittings, and metering connection suitable for supplier.
- D. Batteries: Heavy duty, diesel starting type lead-acid storage batteries, 170 ampere-hours minimum capacity. Match battery voltage to starting system. Include necessary cables and clamps.
- E. Battery Tray: Treated for electrolyte resistance, constructed to contain spillage.
- F. Battery Charger: Current limiting type designed to float at 2.17 volts per cell and equalize at 2.33 volts per cell. Include overload protection, full wave rectifier, DC voltmeter and ammeter, and 120 volts AC fused input. Provide enclosure to meet NEMA 250, Type 1 requirements.
- G. Line Circuit Breaker: NEMA AB 3, molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole, sized in accordance with NFPA 70. Include battery-voltage operated shunt trip, connected to open circuit breaker on engine failure. Unit mount in enclosure to meet NEMA 250, Type 1 requirements.
- H. Engine-Generator Control Panel: NEMA 250, Type 1 mounted control panel enclosure with engine and generator controls and indicators. Include provision for padlock and the following equipment and features:

1. Frequency Meter: 45-65 Hz. range, 3.5 inch dial.
 2. AC Output Voltmeter: 3.5 inch dial, 2 percent accuracy, with phase selector switch.
 3. AC Output Ammeter: 3.5 inch dial, 2 percent accuracy, with phase selector switch.
 4. Output voltage adjustment.
 5. Push-to-test indicator lamps, one each for low oil pressure, high water temperature, overspeed, and overcrank.
 6. Engine start/stop selector switch.
 7. Engine running time meter.
 8. Oil pressure gauge.
 9. Water temperature gauge.
 10. Auxiliary Relay: 3PDT, operates when engine runs, with contact terminals prewired to terminal strip.
 11. Additional visual indicators and alarms as required by NFPA 110.
 12. Remote Alarm Contacts: Pre-wire SPDT contacts to terminal strip for remote alarm functions required by NFPA 110 and include a “proof of run” indication.
 13. Shall include Amp Sentry, single-phase, fault protection.
- I. Annunciator Panel: Surface mounted panel with brushed stainless steel. Provide audible and visible indicators and alarms required by NFPA 110.
1. High battery voltage (alarm).
 2. Low battery voltage (alarm).
 3. Low fuel (alarm).
 4. System ready.
 5. Anticipatory-high water temperature.
 6. Anticipatory-low oil pressure.
 7. Low coolant temperature.
 8. Switch in off position (alarm).
 9. Overcrank (alarm).
 10. Emergency stop (alarm).

11. High water temperature (alarm).
 12. Overspeed (alarm).
 13. Low oil pressure (alarm).
 14. Line power available.
 15. Generator power available.
 16. Lamp test and horn silence switch.
- J. Weather-Protective Enclosure: Reinforced steel housing allowing access to control panel and service points, with lockable doors and panels. Include fixed louvers, battery rack, and silencer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.02 FIELD QUALITY CONTROL

- A. Field testing will be performed by factory trained personnel in the present of an Owner's representative.
- B. Provide full load test utilizing portable test bank, if required, for four hours minimum. Simulate power failure including operation of transfer switch, automatic starting cycle, and automatic shutdown and return to normal.
- C. Record in 20-minute intervals during four hour test:
1. Kilowatts.
 2. Amperes.
 3. Voltage.
 4. Coolant temperature.
 5. Room temperature.
 6. Frequency.
 7. Oil pressure.
- D. Test alarm and shutdown circuits by simulating conditions.
- E. Provide Owner with Test Record.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems per manufacturer's recommended practice.

3.04 ADJUSTING

- A. Adjust work under provisions of Division 1.
- B. Adjust generator output voltage and engine speed.

3.05 CLEANING

- A. Clean work under provisions of Division 1.
- B. Clean engine and generator surfaces. Replace oil and fuel filters.

3.06 DEMONSTRATION

- A. Provide systems demonstration for Owner for demonstration of operation and for training.
- B. Describe loads connected to system and restrictions for future load additions.
- C. Simulate power outage by interrupting normal source, and demonstrate that system operates to provide power.

END OF SECTION

SECTION 26 36 00
ENCLOSED TRANSFER SWITCH

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Automatic transfer switch.

1.02 RELATED SECTIONS

- A. Section 26 00 00 - Electrical General Provisions.
- B. Section 26 32 00 - Package Engine-Generator System.

1.03 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. NEMA ICS 1 - General Standards for Industrial Control and Systems.
- C. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies.
- D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

1.04 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data: Provide catalog sheets showing voltage, switch size, ratings and size of switching and overcurrent protective devices, operating logic, short circuit ratings, dimensions, and enclosure details.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.05 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division 1.
- B. Operation Data: Include instructions for operating equipment. Include instructions for operating equipment under emergency conditions when engine generator is running.
- C. Maintenance Data: Include routine preventative maintenance and lubrication schedule. List special tools, maintenance materials, and replacement parts.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience, and with service facilities within 100 miles of project.
- B. Supplier: Authorized distributor of specified manufacturer with minimum three experiences.

1.07 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 1.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to internal components, enclosure and finish.

1.09 FIELD MEASUREMENTS

- A. Verify that field measurements are as instructed by manufacturer.

1.10 MAINTENANCE SERVICE

- A. Furnish service and maintenance of transfer switch for one year from date of Substantial Completion.

1.11 MAINTENANCE MATERIALS

- A. Provide maintenance materials under provisions of Division 1.
- B. Provide two of each special tool required for maintenance.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Onan
- B. Asco
- C. Kohler
- D. Engineer approved equal by Caterpillar

2.02 AUTOMATIC TRANSFER AND MANUALLY OPERATED SWITCH

- A. Description: NEMA ICS 2, automatic transfer switch with manual maintenance capability.

2.03 SERVICE CONDITIONS

- A. Service Conditions: NEMA ICS 1.
- B. Temperature: 90 degrees F.
- C. Altitude: 3,300 feet.

2.04 RATINGS

- A. Voltage: 240 volts, 1-phase, 3- wire, 60 Hz.
- B. Switched Poles: Two with open transition.
- C. Load Inrush Rating: Combination load.
- D. Continuous Rating: 600 amperes.

2.05 PRODUCT OPTIONS AND FEATURES

- A. Indicating Lights: Mount in cover of enclosure to indicate normal source available, alternate source available, and switch position.
- B. Test Switch: Mount in cover of enclosure to simulate failure of normal source.
- C. Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate to normal source.
- D. Transfer Switch Auxiliary Contacts: 1 normally open; 1 normally closed.
- E. Normal Source Monitor: Monitor normal source voltage and frequency; initiate transfer when voltage drops below 85 percent or frequency varies more than 3 Hertz from rated nominal value.
- F. Alternate Source Monitor: Monitor alternate source voltage and frequency; inhibit transfer when voltage is below 85 percent or frequency varies more than 3 Hertz from rated nominal value.
- G. Switched Neutral: Overlapping contacts.

2.06 AUTOMATIC SEQUENCE OF OPERATION

- A. Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor.
- B. Time Delay To Start Alternate Source Engine Generator: 0 to 5 seconds, adjustable.
- C. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.
- D. Time Delay Before Transfer to Alternate Power Source: 0 to 10 seconds, adjustable.
- E. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.
- F. Time Delay Before Transfer to Normal Power: 0 to 10 seconds, adjustable; bypass time delay in event of alternate source failure.
- G. Time Delay Before Engine Shut Down: 0 to 5 minutes, adjustable, of unloaded operation.
- H. Engine Exerciser: Start engine every 7 days; run for 30 minutes before shutting down. Bypass exerciser control if normal source fails during exercising period.

- I. Alternate System Exerciser: Transfer load to alternate source during engine exercising period.

2.07 ENCLOSURE

- A. Enclosure: NEMA, Type 3R.
- B. Finish: Manufacturer's standard Sand (preferred) or Gray enamel.

2.08 VENDOR SERVICE

- A. 100 Amp unit for vendor building or interior vendor panel may be a residential grade switch.
- B. The Circa 2000 building may have sufficient space within the building to mount this switch. Contractor is encouraged to work with Owner to facilitate this occurrence at the Cedar and Scott sites.
- C. If this switch is interior-mounted to the building, NEMA 1 enclosure is acceptable with a lockable front.
- D. Interior-mounted units shall be set to not transfer power to vendor panel during weekly test.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify conditions.
- B. Verify that surface is suitable for transfer switch installation.

3.02 INSTALLATION

- A. Install transfer switches in accordance with manufacturer's instructions.
- B. Provide engraved plastic nameplates with 1/4-inch lettering and attach with mechanical fastening and nameplate adhesive.
- C. Ensure that switch mounting is secure to building structure or floor.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems under provisions of Division 1.

3.04 DEMONSTRATION

- A. Provide systems demonstration under provisions of Division 1.
- B. Demonstrate operation of transfer switch in normal and emergency modes.

END OF SECTION

SECTION 26 45 00
GROUNDING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section includes furnishing and installing copper grounding cable for the equipment and structures.

1.02 QUALITY ASSURANCE

- A. Applicable standards shall be the latest revisions, supplements, and amendments to the following:
1. National Electrical Code (NEC).
 2. American Society for Testing and Materials (ASTM) - B8.
 3. National Electrical Safety Code (NESC).
- B. Acceptable Manufacturers
1. Ground Clamps and Bars
 - a. Burndy Corporation
 - b. Thomas & Betts Company
 2. Grounding Lugs and Grounding Splice Connectors
 - a. Burndy Corporation
 - b. Thomas & Betts Company
 - c. Anderson

PART 2 - PRODUCTS

2.01 GROUNDING SYSTEM

- A. Cable to equipment grounds shall be with compression type bolted lug connections. Lugs shall be copper, tin plated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Contractor shall ground all equipment as shown on the drawings. Ground shall be in conformance with the NEC.
- B. Contractor shall remove all paint, rust, or other non-conducting material from grounding contact surfaces before making connections.
- C. There shall be no splicing of grounding electrode cables unless it is shown on the drawings or approved by the Owner.

END OF SECTION

DIVISION 31

EARTHWORK

SECTION 31 11 00

CLEARING AND GRUBBING

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Remove shrubs within the construction area and/or as indicated.
- C. Related Sections and Work:
 - 1. Excavating, Stripping Topsoil, Filling, Grade: Division 31.

1.02 PROTECTION

- A. All remaining portions of property not scheduled for clearing and grubbing shall be completely protected during clearing and grubbing and removal of material. Any resulting damage shall be repaired or replaced to like new condition by the Contractor responsible.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide all barricades, fences, and warning lights as required to protect persons and property in accordance with all applicable Iowa DOT Specifications and regulations.

PART 3 EXECUTION

3.01 CLEARING/PROCEDURE

- A. In all activities, comply with pertinent regulations of governmental agencies having jurisdictions.
- B. Clearing and Grubbing:
 - 1. Protect all trees and other plant life which are subject to damage during construction.
 - 2. No burning on site permitted.
- C. Disposal of Materials:

1. All material shall become property of the Contractor and shall be removed from the Owner's site by the Contractor. No prolonged accumulation of debris will be allowed.
 - a. Remove all material from the site as removed. Storage of material on the site will not be allowed.
- D. Maintaining Traffic:
1. Ensure minimum interference with roads, driveways, sidewalks, and adjacent facilities.
 - a. Coordinate with Contractor staging requirements and areas defined on drawings.
 2. Do not close or obstruct roads, driveways, and sidewalks without permission from authorities having jurisdiction.
 3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

3.03 CLEAN UP/ACCEPTANCE

- A. Clean up trash and debris caused by clearing operations under this section, keeping premises, roads, and adjacent property clean and neat at all times.

END OF SECTION

SECTION 31 23 00

EXCAVATION AND FILL

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Excavation, backfill, and fill.
 - a. Compaction of materials relative to its placement.
 - 2. All excess material shall be removed from the site.
 - 3. Supply all additional material required to complete the earthwork as indicated on the drawings or herein specified.
 - 4. Provide field-testing, approvals, and reports as herein specified.
 - 5. Note: Ground water could possibly be encountered during excavation.
 - 6. This Contractor shall provide and maintain all erosion and sediment controls, silt fencing and bale check required by governing authorities.
 - a. Coordinate providing this work with all other excavation and earth moving sections of work.

1.02 RELATED SECTIONS

- A. Excavation, filling, compacting required in connection with utility work, and mechanical and electrical work: Divisions 23 and 26.

1.03 QUALITY ASSURANCE

- A. Required Testing:
 - 1. The Owner reserves the right to require and pay for field tests performed by an Iowa licensed professional Engineer. The engineering testing (geotechnical) firm, that shall make the following tests and/or special inspections for compliance with this section of work. The Contractor shall give the testing Engineer/firm a 24-hour notice prior to a required test(s).
 - 2. Excavation Testing:
 - a. Verify that the bottom of all excavations shall be undisturbed stable soils capable of providing the bearing capacity for the item it is supporting.
 - 3. Fill Testing:
 - a. Verify that the bottom of all backfill excavations is free of unstable soil before filling is commenced.
 - b. Perform density tests on all backfill.
 - c. Location of the test shall be as directed by the testing Engineer/firm.

4. The test results shall confirm the required density, compaction, and bearing specified. If the tests are below these requirements, the Contractor shall remove, refill, recompact, and test again at his/her own expense until the specified requirements are achieved.

1.04 PROTECTION

- A. Protect all utilities against damage.
- B. Provide all required barricades and post warning lights for safety of persons.
- C. Protect structures, utilities, and other facilities immediately adjacent to excavations from damage caused by settlement, lateral movement, undermining, washout and other hazards.
 1. Contractor is entirely responsible for strength and adequacy of bracing and shoring, and for safety and support of construction from damage or injury caused by the lack thereof or by movement or settlement.
- D. Comply with all applicable statutes, ordinances, codes and regulations regarding safety and health including local, state, federal and OSHA (Occupational Safety and Health Administration) jurisdictions.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Backfill: All material placed in excavations outside the structure limits is classified as "backfill."
 1. Clean earth free of organic materials.
 2. No solid material larger than 6" in its largest dimension shall be allowed.
 3. Excavated material, below topsoil, from the site is acceptable for backfill.
- B. Granular fill or fill: Material placed under construction is classified as "fill."
 1. Clean, granular fill, with no more than 5 percent of material passing a No. 200 sieve shall be placed immediately under the generator pad and adjacent PCC.
 2. The first 6" of fill immediately under sidewalks shall be clean granular fill.
- C. Topsoil: Topsoil is to be black, fertile and native to the area, free of stones, lumps, clods, plants, roots, sticks or other extraneous materials.
 1. Provide 6" minimum topsoil under all sodded, seeded, or planted areas.
- D. Barricades, fences, warning lights as required to protect persons and property, shall be in accordance with all applicable codes and regulations.

PART 3 EXECUTION

3.01 INSPECTION

A. Existing Utilities:

1. Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during excavation operations.
2. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Engineer immediately for directions as to procedure. Cooperate with the Owner, and public and private utility facilities in operation. Repair damaged utilities to the satisfaction of the utility owner.
3. Do not interrupt existing utilities serving facilities occupied and used by the owner or others, except when permitted in writing by the Engineer and then only after acceptable temporary utility services have been provided.

3.02 INSTALLATION/PROCEDURE

A. Stripping:

1. Strip all black dirt and topsoil to its entire depth, 6" minimum, from areas to be covered by exterior concrete and from areas to be cut or filled.
 - a. Areas to be stripped shall first be scraped clean of all brush, weeds, grass, roots and other materials. This material shall be removed off-site.
 - b. Stockpile the topsoil obtained on the site using care not to mix with subsoil. Pile in locations where it will not interfere with the building or construction operations.
 - c. This black dirt is to be spread as indicated under grading of this section.
 - d. Excess topsoil may be used for general fill for grading except not under any form of construction.

B. General Excavation:

1. Excavate for all subgrade work shown or specified to dimensions indicated, plus sufficient space to permit erection of forms and shoring.
 - a. Do all excavation of every description and of whatever substances encountered to dimensions and elevations indicated and/or specified herein, unless otherwise qualified herein.
2. Contractor shall be responsible to keep all excavations free of water during the entire process of work regardless of cause, source or nature of the water. Dewatering in order to complete this section of work shall be considered incidental to the earthwork.
3. Provide all shoring and bracing necessary to prevent cave-in of excavations or damage to structure. Remove shoring and piling before backfilling is completed, but not until permanent supports are in place.
4. Unauthorized Excavation: If materials are removed beyond indicated subgrade elevations or side dimensions, fill at no extra cost to the owner.
5. Removal of Unsatisfactory Soil Materials:

- a. Excavate unsatisfactory soil materials encountered that extend below the required elevations, to the additional depth directed by the Engineer or Geotechnical Engineer.
- b. Such additional excavation, provided it is not due to the fault or neglect of the Contractor, will be measured as directed by the Engineer and paid for as a change in the work.

C. Filling and Backfilling:

1. Place backfill and fill materials in layers not more than 8" in loose depth. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content of the soil material. Compact each layer to the required percentage of maximum density for each area classification.
2. Do not place backfill or fill material on surfaces that are muddy, frozen or contain frost or ice.
3. The finished compacted areas shall be brought to a reasonable true and even plane at the required elevations and shall be approved by the Engineer prior to further construction operations thereon.
4. Place backfill and fill materials evenly adjacent to structures, to the required elevations. Take care to prevent wedging action of the backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift. Provide bracing to maintain the structure true to required form.
5. Use power-drive hand tampers for compacting materials adjacent to structures.
6. All exterior concrete slabs on grade shall be placed on a bed of sub-base material as specified, compacted as specified, evenly graded and free from all rubbish and debris.

D. Compaction:

1. Control soil compaction during construction for compliance with the percentage of maximum density specified for each area classification.
2. Provide not less than the percentages of the maximum standard proctor density, ASTM D 698, of the same soil material compacted at optimum moisture content, for the actual density of each layer of soil material-in-place.
3. Where the subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply the required amount of water to the surface of subgrade, or layer of soil material in such a manner as to prevent free water appearing on the surface during or subsequent to compaction operations.
4. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified percentage of maximum density.
5. When the existing ground surface has a density less than that specified under "Compaction" for the particular area classification, break up the ground surface, pulverize, moisture condition to the optimum moisture content and compact to the required depth and percentage of maximum density.
6. Where completed areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, re-shape and compact to the required density prior to further construction. Use hand tamping for recompaction over underground utilities, if any.

7. Compaction over ditches less than 3 feet in width and around perimeter of walls and columns for distance of 3 feet from the wall or column shall be done by the use of mechanical hand compactors such as a Jackson Compactor.
- E. Grading:
1. Do all cutting, filling, compacting of fills and grading required to bring the entire project area, outside of buildings to subgrades as follows:
 - a. For surfaced areas (roadways, parking areas, curbs, service courts, steps and walks) to the underside of the respective surfacing, sub-base or base course, as fixed by the finished grades.
 - b. For lawn and planted areas, to 6" below finished grade. Fill and finish grade of such areas with topsoil to bring grade to elevations shown.
 - 1) Topsoil shall be prepared smooth, to final grade and loosened, ready to receive sod or seeding.
 - c. Slope uniformly to meet elevations at walks, drives, etc., and so as to prevent water pockets or irregular surface changes. The subgrade shall be sloped to provide drainage away from the building walls in all directions.
- F. Remove all waste materials, including excavated material classified as unsatisfactory soil material, trash and debris from the owner's property and legally dispose of it.
- G. Maintaining Traffic:
1. Ensure minimum interference with roads, sidewalks and adjacent facilities.
 2. Do not close or obstruct roads or passageways without permission from the Engineer.
 3. If required by the Engineer, provide alternate routes around closed or obstructed traffic ways.

3.03 CLEAN UP/ACCEPTANCE

- A. Protect newly graded areas from traffic and erosion, and keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded and rutted areas to the specified tolerances.
- C. Keep all travel routes free of tracked or spilled materials.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Trenching, backfilling, and compacting for all underground utility lines and services including but not limited to the following:
 - a. Gas lines.
 - 2. All excess material shall be removed from the site.
 - 3. Provide all additional material required to complete the work for this Section as indicated or required.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Backfill Materials: All material placed in trench excavations is classified as "backfill."
 - 1. Clean earth graded and free of organic materials.
 - 2. No solid material larger than 6" in its largest dimension shall be used.
 - 3. Excavated material, below topsoil, from the site is acceptable for backfill.
 - 4. Backfill beneath and within 5' of pavement areas shall be Special Backfill in accordance with Section 4132 of the Standard Specifications.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Utilities:
 - 1. Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the Contracting Authority.
 - 2. If active utility lines are encountered and are not shown on the Drawings, or otherwise made known to the Contractor, promptly take necessary steps to assure that the service is not interrupted.
 - 3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at not additional cost to the Contracting Authority.

4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure his instructions.
 5. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.
- B. Protection of Persons and Property:
1. Barricade open holes and depressions occurring as part of the work, and post warning lights on property adjacent to or with public access.
 2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
 3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.
- C. Dewatering:
1. Remove all water, including rainwater, encountered during trench and substructure work to an approved location by pumps, drains, and other approved methods.
 2. Keep trenches and site construction area free from water.
- D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- E. Maintain access to adjacent areas at all times:
- F. Trenching:
1. Contractor shall provide all necessary protection of the work and for the safety of personnel.
 - a. Prior to backfilling, remove all such protection materials.
 - b. Do not permit such protection materials to remain in the trenches, except when in the opinion of the Engineer, field conditions or the type of materials are such as to make removal of materials impractical. In such cases, the Engineer may permit portions of material to remain in the trench.
 2. Open Cut:
 - a. Excavate for utilities by open cut, except where installation by directional borings are noted otherwise on the Drawings.
 - b. If conditions at the site prevent such open cut and if approved by the Engineer, trenching may be used.
 - c. Short sections of a trench may be tunneled if, in the opinion of the Engineer, the conductor may be installed safely and backfill can be compacted properly into such tunnel.
 - d. Where it becomes necessary to excavate beyond the limits of normal excavation lines in order to remove boulders or other interfering objects, backfill the voids remaining after removal of the objects as directed by the Engineer.

- e. When the void is below the subgrade for the utility bedding, use suitable earth materials and compact to the relative density directed by the Engineer, but in no case to a relative density less than 90 percent.
- f. When the void is in the side of the utility trench or open cut, use suitable earth or sand compacted or consolidated, as approved by the Engineer, but in no case to a relative density less than 80 percent.
- g. Remove boulders and other interfering objects, and backfill voids left by such removal at no additional cost to the Contracting Authority.
- h. Excavating for Appurtenances:
 - 1) Excavate for manholes and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.
 - 2) Overdepth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel, or lean concrete as directed by the Engineer, and at no additional cost to the Contracting Authority.
- 3. Trench to the minimum width necessary for proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing for the utility.
- 4. Depressions:
 - a. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.
 - b. Except where rock is encountered, do not excavate below the depth indicated or specified.
 - c. Where rock is encountered, excavate rock to a minimum overdepth of 4" below the trench depth indicated or specified.
- 5. Where utility runs traverse public property or are subject to governmental or utility company jurisdiction, provide depth, bedding, cover, and other requirements as set forth by legally constituted authority having jurisdiction, but in no case less than the depth shown in the contract documents.
- 6. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace the turn upon completion of the backfilling.
- 7. Cover:
 - a. Provide minimum trench depth indicated below to maintain a minimum cover over the top of the installed item below the finish grade or subgrade.
 - 1) Areas subject to vehicular traffic:
 - a) As shown on the Drawings.
 - 2) Areas not subject to vehicular traffic:
 - a) As shown on the Drawings.
 - 3) All areas:
 - a) Gas Lines – as shown on the Drawings.

G. Backfilling:

- 1. General:
 - a. Except as otherwise specified or directed by special conditions, backfill trenches to the ground surface with selected material approved by the Engineer.

- b. Re-open trenches which have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified, or otherwise correct, to the approval of the Engineer.
- 2. Lower Portion of Trench:
 - a. Deposit approved backfill and bedding material in layers of 6" maximum thickness, and compact with suitable tampers to the density of the adjacent soil or grade, as specified herein, until there is a cover of not less than 12" over utility lines.
 - b. Take special care in backfilling and bedding operations to not damage pipe and pipe coatings.
- 3. Remainder of Trench:
 - a. Except for special materials for pavements, backfill the remainder of the trench with material free from stones larger than 6" or half the layered thickness, whichever is smaller, in any dimension.
 - b. Deposit backfill material in layers not exceeding the thickness specified, and compact each layer to the minimum density directed by the construction soil engineer.
- 4. Adjacent to Buildings: Mechanically compact backfill within 10' of buildings.
- 5. Under or Within 5' of Pavement: Backfill shall be granular material mechanically compacted.
- 6. Consolidation of backfill by jetting with water may be permitted, when specifically approved by the Engineer, in areas other than building and pavement areas.

3.02 FIELD QUALITY CONTROL

- A. The Engineer will inspect open cuts and trenches before installation of utilities, and will make the following tests:
 - 1. Assure the trenches are not backfilled until all tests have been completed.
 - 2. Check backfilling for proper layer thickness and compaction.
 - 3. Verify that test results conform to the specified requirements, and that sufficient tests are performed.
 - 4. Assure that defective work is removed and properly replaced.

3.03 CLEAN UP/ACCEPTANCE

- A. Protect newly graded areas from traffic and erosion, and keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded and rutted areas to the specified tolerances.
- C. Keep all travel routes free of tracked or spilled materials.

END OF SECTION

DIVISION 32

**EXTERIOR
IMPROVEMENTS**

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Division 00 – Procurement and Contracting Requirements and all provisions of Division 01 - General Requirements, apply to this Section.
- B. Section Includes:
 - 1. Fence fabric, posts and related items
 - 2. Excavation for fence posts
 - 3. Gates and related hardware

1.02 SUBMITTALS

- A. Product Data: Required. Include material descriptions, dimensions of individual components and profiles, and finishes for chain link fences and gates.
- B. Shop Drawings Required:
 - 1. Indicate plan layout, spacing of components, accessories, filaments, and anchorage.
 - 2. Submit manufacturer's installation instructions and procedures, including standard details of fence and gate installation.
- C. Samples: Required, see Item 2.02 MATERIALS for selection
 - 1. Fabric colors for selection or approval of Architect.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. A90/A90M, *Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc Alloy Coatings*
 - 2. A 370, *Mechanical Testing of Steel Products*
 - 3. A 392, *Zinc-Coated Steel Chain Link Fence Fabric*
 - 4. F 668, *Polyvinyl Chloride (PVC)-Coated Steel Chain Link Fence Fabric*
 - 5. F 934, *Standard Colors for Polymer Coated Chain Link Fence Materials*
 - 6. F 1043, *Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework*
 - 7. F 1664, *Standard Specification for Polyvinyl Chloride(PVC)-Coated Steel Tension Wire Used with Chain Link-Fence*

- B. Chain Link Fence Manufacturers Institute (CLFMI)

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable manufacturers, subject to compliance with Project requirements:
Master Halco, Inc., Richard's Fence, General Wire and Supply Co., or approved equal.

2.02 MATERIALS

- A. Polyvinyl Chloride (PVC)-Coated Steel Chain Link Fence System:
1. Height: As indicated on drawings.
 2. Fabric: 2" mesh, 9 ga. wire, with turn down knuckled and knubled
 3. Top Rail: 1-5/8" O.D. pipe
 4. Bottom Tension Wire: 7 ga.
 5. Line Posts: 2" O.D. pipe, Schedule 40
 6. End, Corner, Gate, and Pull Posts: 3" O.D. pipe, Schedule 40
 7. Finish:
 - a. Fabric: 2.0 oz. zinc coated as per ASTM A 392 or if noted on the drawings, 6 ga. bonded PVC coating in color as selected by the Architect, if not indicated on the drawings.
 - b. All other components: Finished to match fabric
 8. Gates: Frame 2" O.D. pipe welded at corners. Gate shall have a positive, automatic type latching device operative from both sides of gate with provision for padlocking.
 - a. Padlock: N.I.C.
 - b. Hinges sized to gate size and shall permit 180° swing.
 - c. Vehicle gates shall have automatic keepers which engage each gate leaf and holds it until manually released.
 9. Provide all accessories and hardware required for a complete installation.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Each post shall be anchored as indicated on drawings.
- B. Line posts shall be maximum 10 feet on center.
- C. Provide large gate swing posts as per standards for all gates over 7' - 0" in width.

- D. Top rails shall pass through intermediate post tops and form a continuous brace within each stretch of fence and be securely fastened to terminal posts.
 - 1. Pipe posts shall have tops that exclude moisture.
- E. End, corner, pull and gate posts shall be braced with the same material as the top rail and trussed to line posts with 3/8" rods and tighteners.
- F. Fabric shall be connected:
 - 1. To line posts every 14"
 - 2. To top rail every 24"
 - 3. To end, corner and gate posts by using tension bars connected to the post every 14" with steel bands with bolts and nuts
 - 4. To tension wire with hog rings every 24"

3.02 CLEAN UP/ACCEPTANCE

- A. Adjust gate and hardware to operate freely and properly.

END OF SECTION

SECTION 32 31 19

DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Division 00 – Procurement and Contracting Requirements and all provisions of Division 01 - General Requirements, apply to this Section.
- B. Section Includes:
 - 1. Metal fence pickets, rails, posts, and related accessories
 - 2. Finishing for metal fencing and gates
 - 3. Gates and related hardware

1.02 SUBMITTALS

- A. Product Data: Required. Include material descriptions, dimensions of individual components, and finishes for metal fence and gate(s).
- B. Shop Drawings Required:
 - 1. Indicate plan layout, spacing of components, accessories, and anchorage.
 - 2. Provide complete detailing of fabrication and installation including all anchorage and accessory items. Provide required templates for anchors and bolts specified for installation under other sections.
 - 3. Where metal fencing and gates are specified or required by code to comply with design loading, the shop drawings and structural calculations necessary shall be certified by a Licensed Professional Engineer.
- C. Finishing:
 - 1. Product Data: Manufacturer's data sheets on each paint and coating product, including the following:
 - a. Product characteristics
 - b. Surface preparation instructions and recommendations
 - c. Primer requirements and finish specification
 - d. Storage and handling requirements and recommendations
 - e. Application methods
 - f. Cautions, VOC's
 - 2. Color, if not indicated on the Drawings, will be selected by the Architect and submitted to the Contractor in scheduled form.

1.03 REFERENCES

- A. American Welding Society (AWS): *Structural Welding Code*
- B. ASTM International (ASTM):
 - 1. ASTM A36, *Standard Specification for Carbon Structural Steel*
 - 2. ASTM A47, *Standard Specification for Ferritic Malleable Iron Castings*
 - 3. ASTM A53, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*
 - 4. ASTM A123, *Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products*
 - 5. ASTM A153, *Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*
 - 6. ASTM A385, *Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)*
 - 7. ASTM A500, *Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes*
 - 8. ASTM A992, *Standard Specification for Structural Steel Shapes*

1.04 SYSTEM DESCRIPTION

- A. Structural Requirements: Design, engineer, fabricate and install metal fencing and gates to withstand acceptable standard, code required and/or prescribed structural loads without exceeding the allowable working stress of materials involved, anchors and connections. Apply each loading to each member to produce maximum stress in each fabrication component. Provide Certified Licensed Engineer (licensed by the State authorities where the project is located) Calculations and data, if requested.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide new metal, of the best commercial quality for the purpose intended, free from defects impairing strength, durability and appearance. Conform to the following standards for miscellaneous structural steel framing and miscellaneous non-structural steel:
 - 1. Structural Tube Columns: ASTM A500, Grade B
 - 2. Pipe: ASTM A53, Type S, Grade B
 - 3. Other Structural Steel: ASTM A36
 - 4. Malleable Iron Castings: ASTM A47
 - 5. Fasteners: Bolts, nuts, washers and other fasteners shall conform to the appropriate Federal Specifications.
- B. Gates: Gate shall have a positive, automatic type latching device operative from both sides of gate with provision for padlocking.
 - 1. Padlock: N.I.C.
 - 2. Hinges shall be gravity hinges sized to gate size and shall permit 180° swing.

- C. Miscellaneous Materials:
 - 1. Cold Galvanizing: Welco Cold Galvanizing, by Welco.
 - 2. Non-shrink Grout: Euco N-S Grout, by Euclid.
- D. Provide all accessories and hardware required for a complete installation.
- E. Finishing: Product names and numbers identified below reference Sherwin Williams (S-W) products. Other acceptable paint manufacturers, subject to compliance with the Project requirements, include: Pratt & Lambert, Benjamin Moore, Devco, PPG, Mautz, Hirshfield, or approved equal. Colors and finish as selected by Architect, if not indicated on the Drawings.
 - 1. Metal- Ferrous or Galvanized: High Gloss Latex Enamel
 - a. Touch up - S-W DTM Acrylic Primer/Finish
 - b. 2 Coats – S-W SuperPaint Exterior High Gloss Latex Enamel, A85 Series

PART 3 EXECUTION

3.01 INSTALLATION

- A. Space posts uniformly unless otherwise indicated.
- B. Posts shall be surface mounted as indicated on drawings.
- C. Check each post for vertical and top alignment, and maintain in position during placement and finishing operation.
- D. Install gates, if/where required, plumb, level, and secure for full opening without interference.

3.02 FINISHING

- A. Workmanship: Workmanship shall be of the very best. All materials evenly spread and smoothly flowed on, giving a uniform sheen and color without runs and sags. Transparent finishes shall have all coats brushed out smooth. Only skilled mechanics shall be employed and all materials shall be applied in strict accordance with manufacturer's directions. Except as otherwise specified, only one manufacturer's materials shall be used in each of the finishes specified
- B. Application:
 - 1. Apply all coatings and materials according to the manufacturer's printed recommendations.
 - 2. Do not apply to wet or damp surfaces.

3. Do no exterior painting below 50° F temperature.
4. Paint all exposed surfaces of every member. Paint anything inaccessible after installation before installation, if required to be painted.
 - a. Apply coatings using methods recommended by manufacturer.
 - b. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.
 - c. Apply coatings at spreading rate required to achieve the manufacturer's recommended dry film thickness.
5. Apply all coatings without reduction except as specifically required by label directions, or required by this specification. In such cases, reduction shall be the minimum permitted.
6. Thoroughly cover with uniform color and finish, as necessary for a complete hide, the number of coats specified being a minimum. Undercoats shall be colored to approximately match the final color.

3.03 CLEAN UP/ACCEPTANCE

- A. Clean up debris and unused material, and remove from site.
- B. Final Touch-up:
 1. Where coverage is incomplete or not uniform, as determined by the Architect, provide additional coats at no additional cost to the Owner.
 2. Touch-up damaged coatings after Substantial Completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

END OF SECTION

SECTION 32 31 29

WOOD FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of Division 00 – Procurement and Contracting Requirements and all provisions of Division 01 - General Requirements, apply to this Section.
- B. Section Includes:
 - 1. Wood fence pickets, rails, posts and related accessories
 - 2. Excavation for fence posts
 - 3. Gates and related hardware
- C. Related Sections
 - 1. Section 03 30 00 – Cast-In-Place Concrete: Concrete fill for post holes

1.02 SUBMITTALS

- A. Product Data: Required. Include material descriptions and dimensions of individual components for wood fences.
- B. Shop Drawings Required:
 - 1. Indicate plan layout, spacing of components, accessories, and anchorage.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Western Red Cedar Fence System:
 - 1. Height: As indicated on drawings.
 - 2. Slats: Dog-eared slats, Shadow-box construction
 - 3. Top, bottom, and intermediate rails: 2x4 cedar
 - 4. Corner, gate, end, and/or line posts: 4x4 cedar
 - 5. Gates: Gate shall have a positive, automatic type latching device operative from both sides of gate with provision for padlocking.
 - a. Padlock: N.I.C.
 - b. Hinges sized to gate size and shall permit 180° swing.
 - 6. Provide all accessories and hardware required for a complete installation.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Space posts uniformly at 8'-0" o.c. unless otherwise indicated.
- B. Concrete set posts: Drill hole in firm, undisturbed or compacted soil. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post depth as indicated on drawings. Place concrete around post in a continuous pour. Trowel finish around posts and slope to direct water away from posts.
- C. Check each post for vertical and top alignment, and maintain in position during placement and finishing operation.
- D. Install gates, if/where required, plumb, level, and secure for full opening without interference.

3.02 CLEAN UP/ACCEPTANCE

- A. Clean up debris and unused material, and remove from site.

END OF SECTION

SECTION 32 90 00

PLANTING, TURF, AND GRASSES

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and all provisions of English Standard Specifications for Highway and Bridge Construction, Iowa Department of Transportation, apply to this section.
- B. Section Includes:
 - 1. Lawn - sodden and/or seeding:
 - a. Restore all lawns damaged as a result of completing the construction of this project, including at edges of paved areas.
 - 2. Plantings as per schedule on drawings.
 - a. Layout as per site plan.
 - 3. Bark mulch
 - 4. Rock Mulch
 - 5. Fabric liner
 - 6. Metal edging
 - 7. Excavation for trees and/or plants.
 - 8. Additional topsoil and placing of same for trees and/or plants.

1.02 WARRANTIES, GUARANTEES

- A. Guarantee: All plantings and seeding shall be guaranteed for one year (365 days) from acceptance of project by Owner. Replacement:
 - 1. Remove and replace any plant or seeding (as noted above) that is found dead or not in satisfactory growth.
 - 2. Replacement plants shall be same kind and size as specified for original plants.
 - 3. Cost of replacements shall be at expense of Contractor, except replacement required due to loss or damage due to occupancy of the project, vandalism or acts of neglect on the part of others during the guarantee period, after acceptance. Replacement plants shall be further guaranteed for another year from replacement.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil: Natural, friable, fertile, native peat loam possessing the characteristics of representative topsoil in the vicinity which produces heavy growths of vegetation.
 - 1. Topsoil shall be free from subsoil, noxious weeds, sticks, roots, stones, lime, concrete, ashes, slag or other deleterious matter, and shall be well drained in its original condition and free of toxic quantities of acid or alkaline elements.
 - 2. Contractor to add topsoil to areas receiving seeding as necessary.

- B. Sod: 1 ½" thick free from stones, dandelions, crab grass and weeds. Height of grass when sod is obtained shall not exceed 3". No peat grown sod permitted.
- C. Plant Material:
1. Names and Grades: Plant material shall conform to nomenclature of "Standardized Plant Names" as adopted by the Joint Committee of Horticulture Nomenclature, latest edition. Size and grading standards shall conform to the American Association of Nurserymen, Inc., as published in *American Standard for Nursery Stocks* latest edition. No substitutions of size or grade shall be permitted without written permission of the Engineer. Each bundle of plants and all separate plants, shall be properly identified with legible waterproof tag securely fastened to each plant or bundle of plants.
 2. Plant Schedule: See drawings. The height and caliper of the trees, the height or spread of shrubs, the diameter of the balls of roots are the minimum dimensions required. Plants indicated "B&B" are to be dug with a ball of earth and wrapped in burlap.
 3. Form: Well formed for the species or variety. Trees shall have single trunks, unless clump form is specified. Crotches shall be sound and unsplit.
 4. Digging and Handling: All precautions customary in good trade practice shall be taken in preparing plants for transplanting, in accordance with the *American Standard for Nursery Stock*, latest edition. Workmanship that fails to meet the highest standards will be rejected.
 5. Health: All plants including their roots shall be free from disease, insects or other injurious qualities. Contractor shall comply with all local, states, and federal laws pertaining to the inspection, sale, and shipment of plant materials. The trunk bark of all trees shall be sound. Trees shall have no large wound, and any small wound shall have a satisfactory callus roll formed or forming over them. Plants shall show good annual growth. Buds shall be plump and well filled for the species. Evergreen foliage shall be of good intense color. All plants shall be nursery grown except those trees and shrubs existing on the site that are transplantable. They shall have been growing in similar climatic conditions as the location of the project for at least two years prior to the date of this contract.
 6. Ball and Burlap: All balled and burlapped plants shall conform to the *American Standard for Nursery Stock* latest edition. All balls shall be of natural earth in which the plant has been growing. No manufactured or artificially produced or mudded-in balls shall be accepted. Balls shall be firm and unbroken and of large enough size to adequately enclose the plant's fibrous root system. Balled and burlapped plants may be rejected due to their failure to meet good digging practices.
- D. Water: Clean, free from deleterious substances.
- E. Grass Seed: Seed mix shall be for urban areas as specified in Article 2601.04, Paragraph C, of the Iowa DOT English Standard Specifications.

- F. Landscape Edging: All edging shall be 3/16" x 4" steel (Black) complete with anchor stakes.
- G. Bark Mulch: Commercially or locally processed cedar mulch, shavings, or ground bark free of growth or germination inhibiting ingredients. Mulch to be placed at a minimum of 4" depth.
- H. Rock Mulch: River rock shall be earth tones, minimum 3/4" size. Place at a minimum depth of 3".
- I. Fabric Liner: Duon or equivalent landscape fabric.

PART 3 EXECUTION

3.01 INSTALLATION

- A. All planting shall be done in accordance with Section 2610 and articles of the Iowa DOT English Standard Specifications as stated below:
 - 1. Shrub Planting:
 - a. Layout: All shrubs shall be located as designated on the contract drawings and as directed by the Engineer. Where below ground or overhead obstructions are encountered, the shrubs shall be relocated as directed by Engineer.
 - b. Planting Pits: Shall be in accordance with Article 2610.03.
 - c. Setting of Shrubs: Shall be in accordance with Article 2610.03.
 - d. Pruning: Shall be in accordance with Article 2610.03.
 - e. Maintenance:
 - 1) The Contractor shall be required to make periodic checks on the total project to make certain that the materials are properly watered, cultivated, pruned and that all trees and evergreens are standing plumb, straightening those that are leaning, and that the sum of all conditions are contributing to the satisfactory progress of the materials, until such time as the work is approved by the Engineer and accepted by the Owner.
 - 2. Seeding:
 - a. Seed shall be applied to all disturbed areas not noted for sod, site improvements or landscaping.
 - b. Seeding shall be applied in accordance with Article 2601.04.
 - 3. Mulch Beds Over Liner:
 - a. Install edgings to locations shown on drawings to provide a uniformly level and in line edge.
 - b. All areas as shown on plans where seed or sod and mulch beds touch shall have steel edging installed.

- c. All planting beds or bufferstrips shall receive mulch over a liner unless indicated otherwise on plans. Place liner on subgrade at depth shown. Lap joints 2". If liner is non-perforated type, puncture at approximately 6" centers both directions, holes not to exceed 1/8" diameter.
 - d. Place mulch to uniform 4" depth for hardwood mulch and 3" for rock mulch if not otherwise indicated and flush with edging top.
- 4. Maintenance:
 - a. Commence immediately after each portion of lawn or planting is completed.
 - b. Maintain new plantings and water, mow and replant lawns to establish uniform turf until acceptance of project by Owner. Maintain watering for two weeks minimum regardless of project acceptance date.
 - c. Scattered bare spots in lawn no larger than 1 square foot each will be acceptable up to 3 percent of lawn area.
 - d. Repair any damage resulting from planting operations.

3.02 CLEAN-UP/ACCEPTANCE

- A. Protect/Clean
 - 1. Protect adjoining pavements, walks, structures from dirt and staining during completion of work. Cleaning of same is required.
 - 2. Leave site free of debris from this Section of Work.
 - 3. All ground areas disturbed as a result of planting operations shall be restored to their original condition or to the desired new appearance.
 - 4. Protect completed landscaping from any damage until project is accepted by Owner.

END OF SECTION

(Vendor may copy as needed)

**Due on or Before
June 19, 2009**

**If Required
Mail At Once**

Letting Date: June 26, 2009 1:00 P.M.

**If Required
Mail At Once**

**Iowa Department of Transportation
Bidders Request for Exceptions or Equal
Proposal No.: LT00716**

Item: Furnish and Install Back-up Generators at 4 Interstate Rest Areas Spec. No. _____

Bid Proposal

Requests: _____

Bidder Proposes to furnish in lieu of above: _____

Mail/Fax to:

Iowa Department of Transportation
Attention: Mary Zimmerman
Office of Procurement and Distribution
800 Lincoln Way
Ames, Iowa 50010
Phone No. 515-239-1298
Fax No. 515-239-1538
Mary.zimmerman@dot.iowa.gov

By _____

Company _____

Address _____

City State Zip Code

Phone No. _____

Fax No. _____

DOT USE ONLY

Approved _____

Disapproved _____

Reason _____

Signature: _____

Date: _____



Iowa Department of Transportation

Office of Purchasing

PROPOSAL GUARANTY (Bid Bond Form)

KNOW ALL PERSONS BY THESE PRESENTS: That we, _____
(Bidder's Name)
_____ of _____
(City, State)
as principal, and the _____
(Surety)
of _____ as Surety, are held and firmly bound unto the Iowa Department of
(Address)

Transportation and to the State of Iowa, or Municipality as defined in Iowa Code Section 23.1 as applicable, hereinafter defined as Obligee, in the penal sum as shown in the contract documents of the specified project, for which payment said principal and surety bind themselves, their heirs, executors, administrators, successors, and assigns jointly and severally, firmly by these presents.

WHEREAS, the principal is herewith submitting his/her or its sealed proposal for:

Item Description _____, or
(Commodity)
Type of Work _____
(Service)
Date of Letting _____, 20 ____.

NOW THEREFORE, if the said proposal bid by said principal be accepted, and the principal shall enter into a contract with the Obligee in accordance with the terms of such bid, and give such bond as may be specified in the bidding or contract documents with good and sufficient surety for the faithful performance of such contract and for the prompt payment of labor and material furnished in the prosecution thereof, then this obligation shall become null and void or in the event of the failure of the principal to enter such contract and give such bond, the principal shall pay to the Obligee the full amount of the bid bond, together with court costs, attorney's fees, and any other expense of recovery.

IN WITNESS WHEREOF, the principal and surety have caused these presents to be signed this _____ day of _____, 20 ____.

Principal
(Bidder's Name)
By _____
Bidder's Signature

Surety
By _____
Authorized Surety Representative

Bidder _____

SEALED BID

PROPOSAL NO: _____

PROPOSAL
DESCRIPTION: _____

LETTING DATE: _____

**Iowa Department of Transportation
PURCHASING – SEALED BID PROPOSAL
800 Lincoln Way
Ames, Iowa 50010**